APPENDIX T:
MATHEMATICS ALIGNMENT STUDY TECHNICAL REPORT

REPORT

Alignment Analysis of Mathematics Standards and Assessments

Michigan
Grades 3–8

Norman L. Webb
November 15, 2005

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This study is one of the three alignment studies conducted for the State of Michigan. The Alignment Analysis Institute was held September 21–23, 2005, in Lansing, Michigan. The report consists of a description of the four criteria used to judge the alignment between Michigan Mathematics Academic Content Standards and one assessment for each grade. Grade 3 assessment was compared to grade 2 standards, grade 4 assessment was compared to grade 3 standards, grade 5 assessment was compared to the grade 4 standards, grade 6 assessment was compared to grade 5 standards, grade 7 assessment was compared to grade 6 standards, and the grade 8 assessment was compared to grade 7 standards. This report includes tables listing the results of 7 to 13 reviewers' coding of the assessments.

Acknowledgements

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Executive Summary

This is a report of the results from a three-day Alignment Analysis Institute that was conducted September 21, 22, and 23, 2005, in Lansing, Michigan. Thirteen reviewers, including mathematics content experts, district mathematics supervisors, mathematics teachers, and a mathematics education professor, met to analyze the agreement between the state's mathematics standards and Michigan Educational Assessment Program assessments for six grades. Ten reviewers were from Michigan, and 3 were experts brought in from other states. Twelve to 13 reviewers analyzed grades 3, 4, and 5 assessments, while 6 or 7 reviewers analyzed grades 6, 7, and 8 assessments. Because of time constraints the reviewers were divided into two groups to analyze the assessments for the higher grades. All of the reviewers participated in analyzing the depth-of-knowledge levels of the standards.

Overall, the alignment between the mathematics assessments and standards at five of the six grades is reasonable. The grade 6 assessment was fully aligned. Full alignment between the assessments at grades 4, 5, 7, and 8 and the previous grade standards could be achieved by replacing one item (grades 4, 5, and 8) or three items (grade 7) on each assessment. Full alignment for the grade 3 assessment and grade 2 standards would require replacing six items with items that measure content related to data and probability. Reviewers did have some problems coding items to specific standards because limits imposed on number size and type of number in the grade-level expectations did not fully coincide with the numbers used in the items. As a consequence, reviewers coded a relatively large number of items to the goal or standard rather than to specific grade level expectations. The lack of exact fit between an assessment item and a grade-level expectation could be due to the grade-level expectations being overly restrictive, or to test blueprint specifications that did not attend to the stated limits. Although, reviewers did code a relative high number of items to the goal or standard, this was not such a serious issue as to consider the assessments and standards not aligned.

Alignment Analysis of Mathematics Standards and Assessments

Michigan
Grades 3-8

Norman L. Webb

Introduction

The alignment of expectations for student learning with assessments for measuring students' attainment of these expectations is an essential attribute for an effective standards-based education system. Alignment is defined as the degree to which expectations and assessments are in agreement and serve in conjunction with one another to guide an education system toward students learning what they are expected to know and do. As such, alignment is a quality of the relationship between expectations and assessments and not an attribute of any one of these two system components. Alignment describes the match between expectations and assessment that can be legitimately improved by changing either student expectations or the assessments. As a relationship between two or more system components, alignment is determined by using the multiple criteria described in detail in a National Institute for Science Education (NISE) research monograph, *Criteria for Alignment of Expectations and Assessments in Mathematics and Science Education* (Webb, 1997).

A three-day Alignment Analysis Institute was conducted September 21, 22, and 23, 2005, in Lansing, Michigan. Thirteen reviewers, including mathematics content experts, district mathematics supervisors, mathematics teachers, and a mathematics education professor, met to analyze the agreement between the state's mathematics standards and Michigan Educational Assessment Program assessments for six grades. Ten reviewers were from Michigan, and 3 were experts brought in from other states. The assessments for each grade, beginning with grade 3, were compared to the curriculum standards in the previous grades because the tests are administered in the fall. All of the reviewers participated in analyzing the standards and assigning a depth-of-knowledge (DOK) level to each grade level expectation or objective. Twelve or 13 of the reviewers coded the first three assessments. Because of time constraints and the coding speed of some reviewers, the reviewers were divided into two groups to code the other three assessments. At least 6 reviewers coded each assessment.

For the purposes of this analysis, we have employed the convention of standards, goals, and objectives to describe three levels of expectations for what students are to know and do. Standard is used here as the most general (for instance, *Data and Probability*). There are four or five such standards for each grade level. Grades 2 through 5 do not have an algebra standard. The grade 6 standards include a standard for algebra and one for measurement. In grade 7, the measurement standard is dropped. Each standard is comprised of one to four goals, each of which is comprised of up to 15

objectives. These objectives are intended to span the content of the goals and standards under which they fall. The standards, goals, and objectives are shown in Appendix A.

The number of items on the mathematics assessments varied some by grade. The grade 3 assessment had 63 items, the grade 8 assessment had 67 items, and the assessments for grades 4 through 7 had from 69 to 71 items. All of the items were multiple choice, each counted as one point. Thus, the number of points for each assessment was the same as the number of items.

Reviewers were trained to identify the depth-of-knowledge of objectives and assessment items. This training included reviewing the definitions of the four depth-of-knowledge (DOK) levels and then reviewing examples of each. Then the reviewers participated in 1) a consensus process to determine the depth-of-knowledge levels of the Michigan objectives and 2) individual analyses of the assessment items of each of the assessments. Following individual analyses of the items, reviewers participated in a debriefing discussion in which they gave their overall impressions of the alignment between the assessment and the Michigan curriculum standards for grades 2-7.

To derive the results on the degree of agreement between the Michigan mathematics standards and each assessment, the reviewers' responses are averaged. Any variance among reviewers is considered legitimate, with the true depth-of-knowledge level for the item falling somewhere between two or more assigned values. Such variation could signify a lack of clarity in how the objectives were written, the robustness of an item that can legitimately correspond to more than one objective, and/or a depth of knowledge that falls between two of the four defined levels. Reviewers were allowed to identify one assessment item as corresponding to up to three objectives—one primary hit (objective) and up to two secondary hits. However, reviewers could only code one depth-of-knowledge level to each assessment item, even if the item corresponded to more than one objective. Finally, in addition to learning the process, reviewers were asked to provide suggestions for improving the process.

Reviewers were instructed to focus primarily on the alignment between the state standards and the various assessments. However, they were encouraged to offer their opinions on the quality of the standards, or of the assessment activities/items, by writing a note about the item. Reviewers could also indicate whether there was a source-of-challenge issue with the item—i.e., a problem with the item that might cause a student who knows the material to give a wrong answer, or enable someone who does not have the knowledge being tested to answer the item correctly. For example, a mathematics item that involves an excessive amount of reading may represent a source-of-challenge issue because the skill required to answer is more a reading skill than a mathematics skill.

The results produced from the institute pertain only to the issue of agreement between the Michigan state standards and the assessment instruments. Note that this alignment analysis does not serve as external verification of the general quality of the state's standards or assessments. Rather, only the degree of alignment is discussed in these results. The averages of the reviewers' coding were used to determine whether the

alignment criteria were met. When reviewers did vary in their judgments, the averages lessened the error that might result from any one reviewer's finding. Standard deviations are reported, which give one indication of the variance among reviewers.

To report on the results of an alignment study of Michigan's curriculum standards and six assessments, the study addressed specific criteria related to the content agreement between the state standards and grade-level assessments. Four alignment criteria received major attention: categorical concurrence, depth-of-knowledge consistency, range-of-knowledge correspondence, and balance of representation.

Alignment Criteria Used for This Analysis

This analysis, which judged the alignment between standards and assessments on the basis of four criteria, also reported on the quality of items by identifying items with sources of challenge and other issues. For each alignment criterion, an acceptable level was defined by what would be required to assure that a student had met the standards.

Categorical Concurrence

An important aspect of alignment between standards and assessments is whether both address the same content categories. The categorical-concurrence criterion provides a very general indication of alignment if both documents incorporate the same content. *The criterion of categorical concurrence between standards and assessment is met if the same or consistent categories of content appear in both documents.* This criterion was judged by determining whether the assessment included items measuring content from each standard. The analysis assumed that the assessment had to have at least six items measuring content from a standard in order for an acceptable level of categorical concurrence to exist between the standard and the assessment. The number of items, six, is based on estimating the number of items that could produce a reasonably reliable subscale for estimating students' mastery of content on that subscale. Of course, many factors have to be considered in determining what a reasonable number is, including the reliability of the subscale, the mean score, and cutoff score for determining mastery. Using a procedure developed by Subkoviak (1988) and assuming that the cutoff score is the mean and that the reliability of one item is .1, it was estimated that six items would produce an agreement coefficient of at least .63. This indicates that about 63% of the group would be consistently classified as masters or nonmasters if two equivalent test administrations were employed. The agreement coefficient would increase if the cutoff score is increased to one standard deviation from the mean to .77 and, with a cutoff score of 1.5 standard deviations from the mean, to .88. Usually states do not report student results by standards, or require students to achieve a specified cutoff score on subscales related to a standard. If a state did do this, then the state would seek a higher agreement coefficient than .63. Six items were assumed as a minimum for an assessment measuring content knowledge related to a standard and as a basis for making some decisions about students' knowledge of that standard. If the mean for six items is 3 and one standard deviation is one item, then a cutoff score set at 4 would produce an agreement coefficient of .77. Any fewer items with a mean of one-half of the items would require a cutoff that

would only allow a student to miss one item. This would be a very stringent requirement, considering a reasonable standard error of measurement on the subscale.

Depth-of-Knowledge Consistency

Standards and assessments can be aligned not only on the category of content covered by each, but also on the basis of the complexity of knowledge required by each. *Depth-of-knowledge consistency between standards and assessment indicates alignment if what is elicited from students on the assessment is as demanding cognitively as what students are expected to know and do as stated in the standards.* For consistency to exist between the assessment and the standard, as judged in this analysis, at least 50% of the items corresponding to an objective had to be at or above the level of knowledge of the objective: 50%, a conservative cutoff point, is based on the assumption that a minimal passing score for any one standard of 50% or higher would require the student to successfully answer at least some items at or above the depth-of-knowledge level of the corresponding objectives. For example, assume an assessment included six items related to one standard and students were required to answer correctly four of those items to be judged proficient—i.e., 67% of the items. If three, 50%, of the six items were at or above the depth-of-knowledge level of the corresponding objectives, then for a student to achieve a proficient score would require the student to answer correctly at least one item at or above the depth-of-knowledge level of one objective. Some leeway was used in this analysis on this criterion. If a standard had between 40% to 50% of items at or above the depth-of-knowledge levels of the objectives, then it was reported that the criterion was "weakly" met.

Interpreting and assigning depth-of-knowledge levels to both objectives within standards and assessment items is an essential requirement of alignment analysis. These descriptions help to clarify what the different levels represent in mathematics:

Level 1 (Recall) includes the recall of information such as a fact, definition, term, or a simple procedure, as well as performing a simple algorithm or applying a formula. That is, in mathematics, a one-step, well-defined, and straight algorithmic procedure should be included at this lowest level. Other key words that signify a Level 1 include "identify," "recall," "recognize," "use," and "measure." Verbs such as "describe" and "explain" could be classified at different levels, depending on what is to be described and explained.

Level 2 (Skill/Concept) includes the engagement of some mental processing beyond a habitual response. A Level 2 assessment item requires students to make some decisions as to how to approach the problem or activity, whereas Level 1 requires students to demonstrate a rote response, perform a well-known algorithm, follow a set procedure (like a recipe), or perform a clearly defined series of steps. Keywords that generally distinguish a Level 2 item include "classify," "organize," "estimate," "make observations," "collect and display data," and "compare data." These actions imply more than one step. For example, to compare data requires first identifying characteristics of the objects or phenomenon and then grouping or ordering the objects. Some action verbs,

such as “explain,” “describe,” or “interpret,” could be classified at different levels depending on the object of the action. For example, interpreting information from a simple graph, requiring reading information from the graph, also is a Level 2. Interpreting information from a complex graph that requires some decisions on what features of the graph need to be considered and how information from the graph can be aggregated is at Level 3. Level 2 activities are not limited to just number skills, but can involve visualization skills and probability skills. Other Level 2 activities include noticing and describing non-trivial patterns, explaining the purpose and use of experimental procedures; carrying out experimental procedures; making observations and collecting data; classifying, organizing, and comparing data; and organizing and displaying data in tables, graphs, and charts.

Level 3 (Strategic Thinking) requires reasoning, planning, using evidence, and a higher level of thinking than the previous two levels. In most instances, requiring students to explain their thinking is at Level 3. Activities that require students to make conjectures are also at this level. The cognitive demands at Level 3 are complex and abstract. The complexity does not result from the fact that there are multiple answers, a possibility for both Levels 1 and 2, but because the task requires more demanding reasoning. An activity, however, that has more than one possible answer and requires students to justify the response they give would most likely be at Level 3.
Other Level 3 activities include drawing conclusions from observations; citing evidence and developing a logical argument for concepts; explaining phenomena in terms of concepts; and using concepts to solve problems.

Level 4 (Extended Thinking) requires complex reasoning, planning, developing, and thinking, most likely over an extended period of time. The extended time period is not a distinguishing factor if the required work is only repetitive and does not require applying significant conceptual understanding and higher-order thinking. For example, if a student has to take the water temperature from a river each day for a month and then construct a graph, this would be classified as at Level 2. However, if the student is to conduct a river study that requires taking into consideration a number of variables, this would be at Level 4. At Level 4, the cognitive demands of the task should be high and the work should be very complex. Students should be required to make several connections—relate ideas *within* the content area or *among* content areas—and have to select one approach among many alternatives on how the situation should be solved, in order to be at this highest level. Level 4 activities include developing and proving conjectures; designing and conducting experiments; making connections between a finding and related concepts and phenomena; combining and synthesizing ideas into new concepts; and critiquing experimental designs.

Range-of-Knowledge Correspondence

For standards and assessments to be aligned, the breadth of knowledge required on both should be comparable. *The range-of-knowledge criterion is used to judge whether a comparable span of knowledge expected of students by a standard is the same as, or corresponds to, the span of knowledge that students need in order to correctly*

answer the assessment items/activities. The criterion for correspondence between span of knowledge for a standard and an assessment considers the number of objectives within the standard with one related assessment item/activity. Fifty percent of the objectives for a standard had to have at least one related assessment item in order for the alignment on this criterion to be judged acceptable. This level is based on the assumption that students' knowledge should be tested on content from over half of the domain of knowledge for a standard. This assumes that each objective for a standard should be given equal weight. Depending on the balance in the distribution of items and the necessity for having a low number of items related to any one objective, the requirement that assessment items need to be related to more than 50% of the objectives for a standard increases the likelihood that students will have to demonstrate knowledge on more than one objective per standard to achieve a minimal passing score. As with the other criteria, a state may choose to make the acceptable level on this criterion more rigorous by requiring an assessment to include items related to a greater number of the objectives. However, any restriction on the number of items included on the test will place an upper limit on the number of objectives that can be assessed. Range-of-knowledge correspondence is more difficult to attain if the content expectations are partitioned among a greater number of standards and a large number of objectives. If 50% or more of the objectives for a standard had a corresponding assessment item, then the range-of-knowledge criterion was met. If between 40% to 50% of the objectives for a standard had a corresponding assessment item, the criterion was "weakly" met.

Balance of Representation

In addition to comparable depth and breadth of knowledge, aligned standards and assessments require that knowledge be distributed equally in both. The range-of-knowledge criterion only considers the number of objectives within a standard hit (a standard with a corresponding item); it does not take into consideration how the hits (or assessment items/activities) are distributed among these objectives. *The balance-of-representation criterion is used to indicate the degree to which one objective is given more emphasis on the assessment than another.* An index is used to judge the distribution of assessment items. This index only considers the objectives for a standard that have at least one hit—i.e., one related assessment item per objective. The index is computed by considering the difference in the proportion of objectives and the proportion of hits assigned to the objective. An index value of 1 signifies perfect balance and is obtained if the hits (corresponding items) related to a standard are equally distributed among the objectives for the given standard. Index values that approach 0 signify that a large proportion of the hits are on only one or two of all of the objectives hit. Depending on the number of objectives and the number of hits, a unimodal distribution (most items related to one objective and only one item related to each of the remaining objectives) has an index value of less than .5. A bimodal distribution has an index value of around .55 or .6. Index values of .7 or higher indicate that items/activities are distributed among all of the objectives at least to some degree (e.g., every objective has at least two items) and is used as the acceptable level on this criterion. Index values between .6 and .7 indicate the balance-of-representation criterion has only been "weakly" met.

Source-of-Challenge

The source-of-challenge criterion is only used to identify items on which the major cognitive demand is inadvertently placed and is other than the targeted mathematics skill, concept, or application. Cultural bias or specialized knowledge could be reasons for an item to have a source-of-challenge problem. Such item characteristics may result in some students not answering an assessment item, or answering an assessment item incorrectly, or at a lower level, even though they possess the understanding and skills being assessed.

Findings

Standards

Thirteen reviewers participated in the depth-of-knowledge (DOK) level consensus process for the standards and objectives for the Michigan mathematics standard. A summary of their deliberations is presented in Table 1. The complete group consensus values for each competency and objective can be found in Appendix A.

Table 1
Percent of Objectives by Depth-of-Knowledge (DOK) Levels for Grades 2–7 Standards, Michigan Alignment Analysis for Mathematics

Grade	Total number of objectives	DOK Level	# of objs by Level	% within std by Level
2	39	1	13	33
		2	22	56
		3	4	10
3	41	1	20	48
		2	20	48
		3	1	2
4	56	1	26	46
		2	30	53
5	41	1	21	51
		2	20	48
6	43	1	25	58
		2	18	41
7	31	1	5	16
		2	25	80
		3	1	3

Nearly all of the objectives were judged by the reviewers to have a DOK level of 1 (Recall) and Level 2 (Skill/Concept). Across the six grades, the percentage of objectives judged to be Level 1 ranged from 33% (grade 2) to 58% (grade 6) (Exhibit 1). The percentage of objectives judged to be at Level 2 ranged from 41% (grade 6) to 80%

(grade 7). The proportion of objectives by DOK levels was very similar for each of the first six grades, indicating little increase in sophistication across grades. There was a dramatic increase of objectives judged to be at DOK Level 2 for grade 7, indicating that at this grade nearly all of the objectives expected students to obtain an understanding of mathematics requiring conceptual understanding and skill, with only a few of the objectives at a Recall level.

The content of the assessments over the grade levels showed some progression by incorporating a higher percentage of algebra items in the higher grades and reducing the percentage of items allocated to measurement (Exhibit 2). The proportion of items coded as measuring number and operations, geometry, and data and probability remained nearly the same across the six grades. About 50% of the items over the grades were judged to measure number and operations, 15% geometry and 10 to 15% data and probability.

The reviewers were told that within each standard (e.g., *Number and Operations*) the goals were intended to fully span the content of that standard and, in turn, each goal was spanned by the objectives that fell under it. For this reason, the reviewers only coded items to a goal if there were no objectives targeted by the item. Likewise, the reviewers only coded an item to a standard if there were no objectives or goals that the item targeted. Such items are considered to target a generic objective. A large number of items coded to generic objectives may indicate ways in which a standard's content is not fully spanned or described by its goals or objectives. This may also simply indicate that these items are not as precise as the objectives. Table 2 shows the items on each of the six assessments that were coded to the generic objective by more than one reviewer.

Reviewers were also given the option of coding an item as "uncodable" if it did not fit under any of the standards. No items were considered uncodable by more than one reviewer. This indicates that all of the items on the assessments were judged to relate to some Michigan mathematics standard.

Two or more reviewers coded at least one item on each of the six assessments to a generic objective. On some items, such as items 11 and 12 on the grade 3 assessments, nearly all of the reviewers agreed that the items did not correspond to any specific objective. Reviewers only coded one item on the grade 5 assessment to a goal, the least number of items for all six assessments. The grade 7 assessments had 13 items coded to a goal or standard, nearly 20% of the items. The major use of generic objectives indicates that the objectives in the standards are not written to fully cover all of the content as measured by the assessment item. Attention should be given to all items assigned to generic objectives. However, items on which seven or more reviewers agreed there was not a precise match with an objective deserve particular attention. The notes provided by the reviewers in Table (grade).7 in Appendix B can provide more information about why the reviewers used a generic objective. For examples, for Item 47 on the grade 3 assessment, one reviewer noted, "This problem involves more than 3 digits and regrouping in the problem which is not addressed in the GLCEs." The objective or grade-level expectation only includes numbers with up to two digits. As another example, one reviewer indicated that item 11 "is checking a division problem with an algrorithm or

formula," but did not find a direct match for this item in the grade 6 standards. Three of the six reviewers who analyzed this assessment also coded Item 11 to the goal of NMR.

Table 2
Items Coded to Generic Objectives by More Than One Reviewer for Michigan Alignment Analysis, Mathematics Grades 3–8

Grade Level	Assessment Item	Generic Objective (Number of Reviewers)
3	11	NFL (11)
	12	NFL (10)
	14	NFL (3)
	47	NFL (7)
	65	NFL (2)
	64	NMR (3)
	50	MUN (4)
4	9	NME (2)
	10	NME (5)
	42,50	MUN (4)
	52	MUN (2)
5	4	NMR (2)
6	16	NME (2)
	40,54	NME (4)
	48	NME (3)
	20	NFL (3)
	16,63	NMR (2)
	17,18	GRE (3)
	58, 63	GAN (2)
7	65, 66	NME (2)
	43	NFL (2)
	11	NMR (4)
	49	APA (2)
	46, 67,69, 70	AFO (2)
	55, 56	MTE (2)
	10	G (2)
	36	DPR (2)
8	8	A (2) APA (2)
	9	APR (4)
	61	G (2)
	53	GTR (6)
	11	DRE (2) DNA (1)
	55	DNA (5)
	63	DNA (2)

Alignment of Curriculum Standards and Assessments

Alignment between the assessments for grades 3–8 and the Michigan Mathematics Academic Content Standards for grades 2–7 was found to be reasonable and acceptable, except at grade 3 (Table 3). The match between the assessment and the standards on the four alignment criteria had an acceptable level in nearly all comparisons for all six grades. Reviewers did not find any items on the grade 3 assessment that measured content related to any of the three objectives under the grade 2 Data and Probability Standard. Two of the three objectives could be assessed on an on-demand assessment (D.RE.2 Read and interpret pictographs with scales, using scale factors of 2 and 3 and D.RE.3 Solve problems using information in pictographs; include scales such as "each case represents 2 apples"; avoid half cases).

The grade 6 assessment was fully aligned to the grade 5 academic content standards. The grade 5 and the grade 8 assessments were fully aligned with the previous grade's standards except for a weak level for one standard and the Range-of-Knowledge Correspondence criterion. On the grade 5 assessment, reviewers only coded items as corresponding to 17 of the 37 objectives under the number and operations standard, 46% just below the acceptable level of 50%. The large number of objectives under this standard made it more difficult to achieve the acceptable level on the Range-of-Knowledge Correspondence criterion. Measuring 17 of the objectives indicates that the assessment is addressing some breadth in number and operations and is not considered a large concern for alignment.

On the grade 8 assessment, the items were found to have a slightly lower DOK level than the corresponding objectives under the data and probability standard. One of the objectives under data and probability was judged by the reviewers to have a DOK level of 3 (D.RE.1, Represent and interpret data using circle graphs, stem and leaf plots, histograms, and box-and-whisker plots, and select appropriate representation to address specific questions). Reviewers found items that corresponded to this objective, but rated these items with a DOK level of 2 or 1. The items required students to read or interpret information from these graphical representations, but did not go as far as to have students select appropriate representations, or to actually represent data. The minimum level on the Depth-of-Knowledge Consistency criterion could be fully met by just replacing one item with an item at a higher DOK level. As for grade 5, this is a very minor alignment issue.

The grade 4 assessment did not reach an acceptable level on the Range-of-Knowledge Correspondence criterion with the geometry standard. Reviewers on the average coded items corresponding to 2.77 of the 7 objectives, less than the 50% required to have an acceptable level on the Range criterion. The assessment measured students' knowledge in identifying two- and three-dimensional shapes, but did not measure students' knowledge of geometric properties associated with parallel lines and faces, perpendicular lines, and lines and distances. Full alignment could be achieved by just replacing one item that measured one of the objectives not measured on the existing test.

Table 3
Summary of Acceptable Levels on the Four Alignment Criteria for Mathematics Grades 3–8 Mathematics Assessments for Michigan Alignment Analysis

Standards	Alignment Criteria			
	Categorical Concurrence	Depth-of-Knowledge Consistency	Range of Knowledge	Balance of Representation
Grade 3				
N - Number & Operations	YES	YES	YES	YES
M - Measurement	YES	YES	YES	YES
G - Geometry	YES	YES	YES	YES
D - Data & Probability	NO	NO	NO	NO
Grade 4				
N - Number & Operations	YES	YES	YES	YES
M - Measurement	YES	YES	YES	YES
G - Geometry	YES	YES	NO	YES
D - Data & Probability	YES	YES	YES	YES
Grade 5				
N - Number & Operations	YES	YES	WEAK	YES
M - Measurement	YES	YES	YES	YES
G - Geometry	YES	YES	YES	YES
D - Data & Probability	YES	YES	YES	YES
Grade 6				
N - Number & Operations	YES	YES	YES	YES
M - Measurement	YES	YES	YES	YES
G - Geometry	YES	YES	YES	YES
D - Data & Probability	YES	YES	YES	YES

Table 3 (continued)
Summary of Acceptable Levels on the Four Alignment Criteria for Mathematics Grades 3–8 Mathematics Assessments for Michigan Alignment Analysis

Standards	Alignment Criteria			
	Categorical Concurrence	Depth-of-Knowledge Consistency	Range of Knowledge	Balance of Representation
Grade 7				
N - Number & Operations	YES	YES	YES	YES
A - Algebra	YES	YES	YES	YES
M - Measurement	NO	YES	WEAK	YES
G - Geometry	YES	YES	YES	YES
D - Data & Probability	NO	YES	YES	YES
Grade 8				
N - Number & Operations	YES	YES	YES	YES
A - Algebra	YES	YES	YES	YES
G - Geometry	YES	YES	YES	YES
D - Data & Probability	YES	WEAK	YES	YES

The grade 7 assessment compared to the grade 6 mathematics standards was found to be the most problematic, but even these alignment issues were not very ominous. Reviewers, on the average, coded 5.83 items as corresponding to the measurement standard. Since this was less than the 6 items needed for an acceptable level for Categorical Concurrence, the alignment was not fully met. This small difference is well within the error of the coding process and should not be considered as a large alignment issue. This issue should be reviewed to determine whether one more measurement item should be included on the assessment. Data and probability is more problematic. Reviewers found only four items corresponding to this standard. Two items related to data and probability should be added to the assessment. Overall, only three items are needed to fix these two alignment issues on the grade 7 assessment. Full alignment for the grade 7 assessment and grade 6 standards could be achieved by replacing three items currently measuring content related to number and operations with one measurement item and two data and probability items.

Action Needed for Assessments and Standards to be Fully Aligned

In summary, because the alignment between the assessments for grades 3–8 and the standards for grades 2–7 is reasonable, very few changes are needed to achieve full alignment. To achieve full alignment would require these changes or modifications:

Grade 3. Six items need to be replaced or added that measure content related to Data and Probability. Six items currently measuring content related to number and operations or measurement could easily be replaced with data and probability, without changing the alignment on those two standards.

Grade 4. One item from number and operations needs to be replaced by an item that measures a geometry objective that currently does not have a corresponding item.

Grade 5. Two items currently measuring content knowledge related to number and operations should be replaced by items that measure one of the objectives under number and operations currently not measured. Items that could be replaced are those that relate to objectives N.ME.7 and N.MR.2.

Grade 6. No action required.

Grade 7. Three items need to be replaced. All three items to be replaced could be items related to number and operations and algebra that measure objectives with other related items. These three items should be replaced by one item that relates to measurement and two items that relate to data and probability.

Grade 8. One item currently assessment content knowledge related to data and probability should be replaced by another item measuring similar content, but with a higher DOK level. For example, either item 21 or 39 could be replaced by an item at DOK Level 3.

Some attention should be given to the high number of items that were coded to generic objectives. This suggests more of a problem with the statement of the standards and the limits imposed on the size and type of numbers. The statement of the standards could be changed very slightly by replacing, for example, two-digit numbers with three-digit numbers. Such subtle changes would result in an even tighter alignment between the standards and assessments.

Source of Challenge

Reviewers were asked to indicate whether there was a source-of-challenge issue on any of the items. The concerns expressed by the reviewers are given in the fifth table for each grade (Tables (grade).5) in Appendix B. Reviewers' comments under source of challenge indicate some issues with the statements of the grade level expectations. Other comments point to potential issues with an item. When more than one reviewer has noted a source of challenge for an item, then this item should be given greater consideration for improvement or elimination. However, it is possible that one reviewer observed a valid concern missed by the other reviewers.

Notes

Some reviewers made other comments about the items, which they recorded as notes. These notes are presented in the seventh table for each grade (Tables (grade).7) in Appendix B. The notes of some reviewers correspond to the source of challenge noted by other reviewers. The authors of these notes and of the source-of-challenge notation thus added at times to the number of reviewers who had a concern about a specific item. Reviewers' notes sometimes indicate the match between the item and the objective as being weak. The notes also indicate issues that a reviewer might have found with an item and his/her suggestion regarding how the item could be improved.

General Comments Made By Reviewers

After coding each assessment, each reviewer was asked to complete a sheet with four questions on it about their opinion of the general alignment between the standards and the assessments:

A. For each standard, did the items cover the most important topics you expected by the standard? If not, what topics were not assessed that should have been?
B. For each standard, did the items cover the most important performance (DOK levels) you expected of the standard? If not, what performance was not assessed?
C. Was there any content you expected to be assessed, but found no items assessing that content? What was that content?
D. What is your general opinion of the alignment between the standards and assessment:
   i. Perfect alignment
   ii. Acceptable alignment
   iii. Needs slight improvement
   iv. Needs major improvement
   v. Not aligned in any way.
E. Other Comments.

These responses indicate the reflections of reviewers at the time of coding. They complement and inform the more rigorous analysis, but should not be interpreted as definitive, only impressionistic. The responses by the mathematics reviewers are presented below. First, we begin with overall comments made by all reviewers as a group at the end of the institute. Then, we make some generalizations about the reviewer comments. Finally, we present all of their responses, word for word.

Mathematics Grade 3
(Group summary comments in bold.)

A. For each standard, did the items cover the most important topics you expected by the standard? If not, what topics were not assessed that should have been?

- Yes
- There were no data analysis questions
- Yes
- I didn't see anything involving graphs and thought that there would be one.
- It seemed like only the simplest (comp, identification) standards were covered.
- Yes. Heavy on number line and fractions.
- Topics → expectations. Fractions as a whole. Data (? Future core)
- The items did cover the most important topics. But I thought there would have been more items that involved division.
- Data and probability not covered. Base 10 blocks (representation not test for N.ME) Base 10 blocks (representation!)
- No -- topics left out: (1) inverse relationship of unit fractions N.ME.7 (as denominator goes up size goes down) ½ > 1/3 > l/4 (2) data representation D.RE
- **Not diverse enough. Did not do fractions as a whole (MNE7) – not assessed. Increase of denominators. Did not assess the conceptual understand of fractions. Over explained distance between two points on line.**

B. *For each standard, did the items cover the most important performance (DOK levels) you expected by the standard? If not, what performance was not assessed?*

- DOK 1 & 2 were sufficiently covered.
- No DOK levels 3 or 4 were assessed. I was quite amazed by how many level 1 problems were assessed.
- Yes, particularly for this grade level.
- Yes. I believe they did. However, I think there should be a free response for math that doesn't involve multiple choice so there can be more 3 level tests.
- There were very few items that went beyond routine recall and algorithms
- DOK's of 1 and 2 were well covered.
- I think some of the assessments were at a lower DOK level than some of the objectives the item was coded to.
- 3 – not assessed. No open ended P.S.
- G.GS.2 – Create/break apart 2D/3D shapes
- **More recall and recognition than expected. Could have an open response item. Need to demonstrate their conceptual knowledge.**

C. *Was there any content you expected to be assessed, but found no items assessing that content? What was that content?*

- No
- No
- Data – pictographs

- I didn't see anything involving graphs and thought that there would be one. N.1YE-Fractions as a whole. MUN-reading a thermometer.
- Data representation.
- No. More multiplication. #64 Bookshelf with shelves and book—where is terminology corresponding to multiplication.
- Free-response/data
- There weren't any for Data and Probability. There were some pictograph like questions, but they didn't represent more than one on the scale.
- Data & probability – pictographs. Base 10 blocks (representation!). Reading thermometer.
- Data representation
- Heavy in perimeter, but not as much for area (some felt not ready for area). Pictograph and data were not assessed. Only one item on transformation. Did not see enough multiplication beginning. Some questions on curves felt too much.

D. What is your general opinion of the alignment between the standards and assessment?

- Needs slight improvement
- Needs slight improvement. If we look back to the standards, we see that many were rated at a 2 yet many of the assessment items were a 1.
- Acceptable alignment
- Needs slight improvement
- Needs slight improvement
- Acceptable alignment/Needs slight improvement
- Needs slight improvement
- Acceptable alignment
- Needs slight improvement. Would like to see more algebraic thinking at this level – but this is not a strand unfortunately.
- Needs slight improvement/Needs major improvement. More than slight but not major improvement.
- Needs slight improvement

E. Other comments.

- I'm tired! Tomorrow will be a fresher day—Thanks!
- It would be a good idea to start some kind of constructed response question at this level. I think, despite all the negative talks flying around kids could use lots of practice explaining their thinking.

Mathematics Grade 4
(Group summary comments in bold.)

A. *For each standard, did the items cover the most important topics you expected by the standard? If not, what topics were not assessed that should have been?*

- Expanded notation, G.SR.2
- Yes—No/little measurement/area. No Geometry—parallel, etc. No expanded. Too many "fact families". No ÷ with remainders.
- Not enough fractions, nothing with odd and even numbers, nothing about perpendicular and parallel.
- Division remainders. Use of square units.
- G.SR.2 –not assessed. G.GS.1 – G.GS.3 not assessed (Note: I expected more difficult fraction items).
- Yes & No. N.FL.1, N.FL.2 – not a lot of 2, 3, or 4-digit subtraction. There were some gaps for G.GS & N.FL. G.GS did not touch on points, line segments, 1 & = lines.
- Number & operations: Expanded notation, Add. & sub. of fractions – modeling. Measurement: Calculating area. Geometry: Identifying points, lines, 1 & 11 lines.
- Fraction model using strips or # line.
- Not enough on measurement, esp. area. G.GS.1, 2, 3 = not assessed (geometry)
- **Important topics: Not enough on measurement (area particularly). Not in geometry (lines, segment points). NL1 & 2 (Addition & Subtraction). Not sure what standard to put it under. No standard notation. Little heavy on perimeter. Have focus of fact family together. Think 4th grade more meat than grade 3.**

B. *For each standard, did the items cover the most important performance (DOK levels) you expected by the standard? If not, what performance was not assessed?*

- Bar graphs to be more ½'s of a unit. Fact Families could have been figured out without knowledge of x or ÷. Conversions of years and months → oldest or youngest.
- OK. Too many "fact families". No ÷ with remainders.
- I think so.
- Yes.
- There was a level 3, however, the majority of the questions were 1's or 2's. No division problems with remainders. Temperature got a lot of attention → interesting.
- Yes.
- Yes – almost all 2's.
- Liked open ended problem!
- Too heavy on perimeter, fact families. Division with remainders. No square units.
- **Liked the pre response. As it should be. Challenging items with grade appropriate. Writing the stem needs work.**

C. *Was there any content you expected to be assessed, but found no items assessing that content? What was that content?*

- Lines, line segments.
- No division problems with remainders. Temperature got a lot of attention → interesting.
- GGS, MTE
- G.SR.2 – Front side views of shapes. (G.S1-G.S3) not assessed. N.MR.6 – fractions as # line segment. N.ME.6 – fractions using strips
- Geometry
- **No standard notation. Think there is a big jump from grade 3 to grade 4. Did not see division with remainders or square units. Not enough GGS.1,2, & 3. Needed more attention to measurement. (Too many temperature problems/No side views, top views).**

D. *What is your general opinion of the alignment between the standards and assessment?*

- Needs slight improvement
- Needs slight improvement
- Needs slight improvement
- Acceptable alignment/Needs slight improvement
- Acceptable alignment
- Needs slight improvement
- Acceptable alignment
- Needs slight improvement
- Needs slight improvement
- **Between needs slight improvement and acceptable. Needs slight because there are some missing topics.**

E. *Other comments.*
   - Too much testing on: Fact Families, NFL2, Perimeter, MUN5. Side view, Top view—Geometry
   - It seemed that the assessments were rated higher than the actual standards.
   - Not enough geometry. Too many fact family problems. 4th grade test is a lot harder than 3rd grade – big jump.

Mathematics Grade 5

A. *For each standard, did the items cover the most important topics you expected by the standard? If not, what topics were not assessed that should have been?*

- Equivalent fractions needed more stress/also fractions on number lines. More applied problems. More estimation.
- Not many problems involving number and operations. Few problems involving fraction and decimal operations.
- Improper fractions. N.MR.3.
- Yes, though there was little on reading, writing, and place value of numbers up to 1,000,000. Very little fraction operations and decimal operations.

- Very little with fractions. No decimal computations (OK). Little estimation.
- Not as much comparing of decimals. Not a lot of multiplication and division.
- The area formulas without covering or use of grid sheet.
- No expanded notation. #line should be used more and not just for fract. location. Did not agree with transformation question that asked for a "reflection." Not all fourth graders use that vocabulary – It begins more in fifth. No division with remainders. Too many questions on median.

B. *For each standard, did the items cover the most important performance (DOK levels) you expected by the standard? If not, what performance was not assessed?*

- Knowledge, use of patterns!!!
- Yes
- Many 1's and 2's, there was one 3.
- Yes. Mostly DOK Level = 2s.
- Yes
- Yes
- Distributive property as (48)3 = (3·8) + (3·40) 3(40+8)
- Selecting appropriate tools/& units of measure—too many and all too easy. Too many conversions asking for which is youngest child as a 2 yrs. 2 mos. or 26 mo. or 1 ½ yrs. Etc. Too difficult/confusing to mix in fractions.

C. *Was there any content you expected to be assessed, but found no items assessing that content? What was that content?*

- Only 1 symmetry problem.
- Improper fractions
- Fractions/decimals
- NMR8 & NMR8
- Surface area
- Needed lines/line segments/pts. Etc. Area model used with fractions for equivalency

D. *What is your general opinion of the alignment between the standards and assessment?*

- Acceptable alignment
- Acceptable alignment
- Acceptable alignment
- Acceptable alignment
- Needs slight improvement
- Needs slight improvement
- Needs slight improvement
- Needs slight improvement

E. *Other comments.*

- Seems to be a lot of content to be covered → variety as well.
- Question #69 & #72 & #73 could have one question with even # of data and one with odd to find median.
- Too many of the answers were "a" so kids would probably get it right if question/answer "iffy" to them.

Mathematics Grade 6

A. *For each standard, did the items cover the most important topics you expected by the standard? If not, what topics were not assessed that should have been?*

- Numbers and operations – equivalent fractions. Measurement – converting mL, L, & cm^3 , units of volume.
- I think the majority of the most important topics were covered.
- Overall it seemed fine, but was rather heavy on triangles and area.
- There were very few problems for NFL, particularly related to fractions, which I think are important for their grade.

B. *For each standard, did the items cover the most important performance (DOK levels) you expected by the standard? If not, what performance was not assessed?*

- Yes, mostly 2's.
- The assessment might have been slightly lower than the standard
- I think so?
- Yes (although I have low expectancy for what a multiple choice test is able to assess)

C. *Was there any content you expected to be assessed, but found no items assessing that content? What was that content?*

- No
- There was very little on measurement. Very little, if any, on ratios

D. *What is your general opinion of the alignment between the standards and assessment?*

- Needs slight improvement
- Acceptable alignment
- Acceptable alignment/Needs slight improvement

E. *Other comments.*

Mathematics Grade 7

A. *For each standard, did the items cover the most important topics you expected by the standard? If not, what topics were not assessed that should have been?*

- Algebra strand problems focused almost exclusively on writing expressions for problems—missing: solving equations of form y=mx.
- M.PS.1 not assessed, A.PA.2 not assessed.

B. *For each standard, did the items cover the most important performance (DOK levels) you expected by the standard? If not, what performance was not assessed?*

- The test was mainly composed of Level 2 items. This was expected.

C. *Was there any content you expected to be assessed, but found no items assessing that content? What was that content?*

- Representation focused exclusively on finding coordinates of a point. Missing: no items getting at relationships between variables.
- See Part A. (M.PS.1 not assessed, A.PA.2 not assessed)

D. *What is your general opinion of the alignment between the standards and assessment?*

- Needs slight improvement
- Acceptable alignment

E. *Other comments.*

Mathematics Grade 8

A. *For each standard, did the items cover the most important topics you expected by the standard? If not, what topics were not assessed that should have been?*

- Algebra – APA1, APA2, APA 4, APA5, APA7, APP2, AF01 were not assessed.
- Algebra – APA1, APA2, APA4, APA5, APA7, ARP2, AF01 were not assessed.
- Some of the specific algebra objectives were not covered as well as they could be.
- Being in 3rd grade I do not feel comfortable saying what is the most important. However I felt that there was a heavy emphasis on NFL4 and NFL5 which were too easy.
- Being a 6th grade teacher, I'm not familiar with all 8th grade concepts but it appears that too much emphasis was placed on N.FL., esp. N.FL.4 and very little

on algebraic reasoning.

B. *For each standard, did the items cover the most important performance (DOK levels) you expected by the standard? If not, what performance was not assessed?*

- Yes!
- Yes
- Yes
- Yes
- Concept of *y* intercept (A.PA.6) and inverse proportions (A.PA.7).

C. *Was there any content you expected to be assessed, but found no items assessing that content? What was that content?*

- No
- No
- APA5. AF02
- A.PA.6, A.PA.7

D. *What is your general opinion of the alignment between the standards and assessment?*

- Needs slight improvement
- Needs slight improvement
- Acceptable alignment
- Needs slight improvement
- Needs slight improvement

E. *Other comments.*

- Some problems needed to be more specific to glick, instead of general. Problem #53. Don't understand choice 3.
- There were no GLCEs for "ordered pairs" test items.

Results from the reviewers' opinion of the overall alignment for each assessment by grade is given in Table 4. In general, reviewers felt that the alignment of the assessments and standards was between Acceptable alignment and Needs slight improvement. Toward the end of the institute, when reviewers were coding the higher grades, they had less time to respond to the debriefing questions. As a consequence, the number of reviewers responding is lower for the higher grades. There is some relationship between the reviewers' opinion of the alignment and the data, with grade 6 having better alignment and grades 3, 4, and 8 slightly lower alignment.

Table 4
Average Reviewer Opinion on Overall Alignment of Assessments for Grades 3–8 with the Michigan Mathematics Curriculum Standards for Grades 2–7 (Question D)

Assessment	Avg. Response	Number of Reviewers
Grade 3	2.7	11
Grade 4	2.7	9
Grade 5	2.5	8
Grade 6	2.3	3
Grade 7	2.5	2
Grade 8	2.8	5

(The ratings are (1) Perfect alignment, (2) Acceptable alignment, (3) Needs slight improvement, (4) Needs major improvement, and (5) Not aligned in any way.)

Reliability Among Reviewers

The intraclass correlation among the mathematics reviewers' assignment of DOK levels to items corresponded to the number of reviewers and ranged from 0.73 for grade 7 to 0.93 for grade 4 (Table 5). Reliabilities of over .80 are considered very good. The reliabilities of .70 or higher are considered very reasonable. Thus, the reviewers had good consistency in assigning the DOK levels to items.

Table 5
Intraclass Correlation Among Reviewers in Assigning Item Depth-of-Knowledge Levels for Mathematics

Grade	Intraclass Correlation	Number of Items	Number of Reviewers
3	0.90	71	12
4	0.93	79	13
5	0.91	79	12
6	0.77	78	7
7	0.73	79	6
8	0.83	75	7

Summary

Overall, the alignment between the mathematics assessments and standards at five of the six grades is reasonable. The grade 6 assessment was fully aligned. Full alignment between the assessments at grades 4, 5, 7, and 8 and the previous grade-level standards could be achieved by replacing one item (grades 4, 5, and 8) or three items (grade 7) on each assessment. Full alignment for the grade 3 assessment and grade 2 standards would require replacing six items with items that measure content related to data and probability. Reviewers did have some problems coding items to specific standards because the limits imposed on number size and type of number in the grade-level expectations did not fully coincide with the numbers used in the items. As a consequence, reviewers coded a relative large number of items to the goal or standard, rather than to specific grade-level expectations. The lack of exact fit between an assessment item and a grade-level expectation could be due to the fact that the grade-level expectations were overly restrictive, or to the fact that the test blueprint specifications did not attend to the stated limits. Although reviewers did code a relatively high number of items to the goal or standard, this was not such an issue as to consider the assessments and standards not aligned.

References

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Appendix T.1:

Michigan Grades 2–7 Mathematics Standards and Group Consensus DOK Values

Table 4.12
Group Consensus
MI Mathematics Grade 3, Mathematics, Grade 3

Level	Description	DOK
N	Number & Operations	2
N.ME	Meaning, notation, place value, and comparisons	2
N.ME.1	Count to 1000 by 1's, 10's, and 100's starting from any number in the sequence.	1
N.ME.2	Read and write numbers to 1000 in numerals and words, and relate them to the quantities they represent.	2
N.ME.3	Compare and order numbers to 1000; use the symbols > and <.	2
N.ME.4	Recognize, name, and represent commonly used unit fractions with denominators 12 or less; model 1/2, 1/3, and 1/4 by folding strips	2
N.ME.5	Recognize, name, and write commonly used fractions:	1
N.ME.6	Place 0 and halves on the number line; relate to a ruler	1
N.ME.7	For unit fractions from 1/12 to 1/2, understand the inverse relationship between the size of a unit fraction and the size of the denominator; compare unit fractions from 1/12 to 1/2.	2
N.ME.8	Recognize that fractions such as 2/2, 3/3, and 4/4 are equal to the whole (one).	1
N.FL	Fluency with operations and estimation	2
N.FL.1	Decompose 100 into addition pairs.	2
N.FL.2	Add fluently two numbers up to two digits each, using strategies including formal algorithms; subtract fluently two numbers up to two digits each.	1
N.FL.3	Estimate and calculate the sum of two numbers with three digits that do not require regrouping.	2
N.FL.4	Develop strategies for fluently multiplying numbers up to 5 x 5.	3
N.MR	Number relationships and meaning or operations	2
N.MR.1	Find the distance between numbers on the number line.	1
N.MR.2	Find missing values in open sentences; use relationship between addition and subtraction.	2
N.MR.3	Given a contextual situation that involves addition and subtraction for numbers up to two digits: model using objects or pictures, explain in words, record using numbers and symbols; solve.	3
N.MR.4	Understand multiplication as the result of counting the total number of objects in a set of equal groups.	1
N.MR.5	Represent multiplication using area and array models.	2
N.MR.6	Understand division (÷) as another way of expressing multiplication, using fact families within the 5 x 5 multiplication table; emphasize that division "undoes" multiplication.	2
N.MR.7	Given a simple situation involving groups of equal size or of sharing equally, represent with objects, words, and symbols; solve.	2
M	Measurement	2
M.UN	Units and systems or measurement	2
M.UN.1	Measure lengths in meters, centimeters, inches, feet, and yards approximating to the nearest whole unit and using abbreviations: cm, m, in, ft, yd.	1
M.UN.2	Measure area using non-standard units to the nearest whole unit.	2
M.UN.3	Using both A.M. and P.M., tell and write time from the clock face in 5 minute intervals, and from digital clocks to the minute; include reading time: 9:15 as nine-fifteen and 9:50 as nine-fifty. Interpret time both as minutes after the hour and minutes be	2

Table 4.12
Group Consensus
MI Mathematics Grade 3, Mathematics, Grade 3

M.UN.4	Use the concept of duration of time.	2
M.UN.5	Read and write amounts of money using decimal notations.	1
M.UN.6	Read temperature using the scale on a thermometer in degrees Fahrenheit.	1
M.TE	Techniques and formulas for measurement	2
M.TE.1	Find the area of a rectangle with whole number side lengths by covering with unit squares and counting, or by using a grid of unit squares; write the area as a product.	2
M.PS	Problem solving involving measurement	2
M.PS.1	Compare lengths; add and subtract lengths (no conversion of units).	1
M.PS.2	Add and subtract money in mixed units.	2
M.PS.3	Solve simple word problems involving length and money.	2
G	Geometry	2
G.GS	Geometric shape, properties, and mathematical arguments	2
G.GS.1	Identify, describe, and compare familiar two-dimensional and three-dimensional shapes, such as triangles, rectangles, squares, circles, semi-circles, spheres, rectangular prisms.	2
G.GS.2	Explore and predict the results of putting together and taking apart two-dimensional and three-dimensional shapes.	3
G.GS.3	Draw rectangles and triangles, and compute perimeters by adding lengths of sides, recognizing the meaning of perimeter.	2
G.GS.4	Distinguish between curves and straight lines and between curved surfaces and flat surfaces.	1
G.SR	Spatial reasoning and geometric modeling	3
G.SR.1	Classify familiar plane and solid objects by common attributes such as shape, size, color, roundness or number of corners and explain which attributes are being used for classification.	3
G.TR	Transformation and symmetry	1
G.TR.1	Recognize that shapes that have been slid, turned or flipped are the same shape.	1
G.LO	Location and spatial relationships	2
G.LO.1	Find and name locations using simple coordinate systems such as maps and first quadrant grids.	2
D	Data & Probability	2
D.RE	Data representation	2
D.RE.1	Make pictographs using a scale representation, using scales where symbols equal more than one.	2
D.RE.2	Read and interpret pictographs with scales, using scale factors of 2 and 3.	2
D.RE.3	Solve problems using information in pictographs; include scales such as “each case represents 2 apples.”; avoid half cases.	2

Table 4.12
Group Consensus
MI Mathematics Grade 3, Mathematics, Grade 3

Level	Description	DOK
N	Number & Operations	2
N.ME	Meaning, notation, place value, and comparisons	1
N.ME.1	Read and write numbers to 10,000 in both numerals and words, and relate them to the quantities they represent.	1
N.ME.2	Recognize and use expanded notation for numbers using place value to 10,000s place identify the place value of a digit in a number.	1
N.ME.3	Compare and order numbers up to 10,000.	1
N.ME.4	Know that even numbers end in 0, 2, 4, 6, or 8; name a whole number quantity that can be shared in two equal groups or grouped into pairs with no remainders; recognize even numbers as multiples of 2. Know that odd numbers end in 1, 3, 5, 7, or 9, and work with patterns involving even and odd numbers.	1
N.ME.5	Understand that fractions may represent a portion of a whole unit that has been partitioned into parts of equal area or length; use the terms "numerator" and "denominator."	1
N.ME.6	Recognize, name and use equivalent fractions with denominators 2, 4, and 8, using strips as area models.	2
N.ME.7	Place fractions with denominators of 2, 4, and 8 on the number line; relate the number line to a ruler; compare and order up to three fractions with denominators 2, 4, and 8.	2
N.ME.8	Understand that any fraction can be written as a sum of unit fractions.	1
N.ME.9	Understand the meaning of $0.50 and $0.25 related to money.	1
N.FL	Fluency with operations and estimation	1
N.FL.1	Add and subtract fluently two numbers: up to and including two-digit numbers with regrouping and up to four-digit numbers without regrouping.	1
N.FL.2	Estimate the sum and difference of two numbers with three digits (sums up to 1000), and judge reasonableness of estimates.	2
N.FL.3	Find products fluently up to 10 x 10; find related quotients using multiplication and division relationships.	1
N.MR	Number relationships and meaning or operations	2
N.MR.1	Use multiplication and division fact families to understand the inverse relationship of these two operations; express a multiplication statement as an equivalent division statement.	2
N.MR.2	Recognize situations that can be solved using multiplication and division including finding "How many groups?" and "How many in a group?" and write mathematical statements for those situations.	2
N.MR.3	Find solutions to open sentences, such as 7 x _ = 42 or 12 ÷ _ = 4, using the inverse relationship between multiplication and division.	2
N.MR.4	Solve simple division problems involving remainders, viewing remainder as the "number left over" (less than the divisor); interpret based on problem context.	2
N.MR.5	Given problems that use any one of the four operations with appropriate numbers, represent with objects, words, (including "product" and "quotient"), and mathematical statements; solve.	2
N.MR.6	Recognize that addition and subtraction of fractions with equal denominators can be modeled by joining or taking away segments on the number line.	2

Table 4.12
Group Consensus
MI Mathematics Grade 3, Mathematics, Grade 3

M	Measurement	1
M.UN	Units and systems or measurement	1
M.UN.1	Know and use common units of measurements in length, weight and time.	1
M.UN.2	Measure in mixed units within the same measurement system for length, weight and time: feet and inches, meters and centimeters, kilograms and grams, pounds and ounces, liters and milliliters, hours and minutes, minutes and seconds, years and months.	1
M.UN.3	Understand relationships between sizes of standard units.	2
M.UN.4	Know benchmark temperatures such as freezing (32°F, 0°C); boiling (212°F, 100°C); and compare temperatures to these.	1
M.UN.5	Know the definition of area and perimeter and calculate the perimeter of a square and rectangle given whole number side lengths.	1
M.UN.6	Use square units in calculating area by covering the region and counting the number of square units.	1
M.UN.7	Distinguish between units of length and area and choose a unit appropriate in the context.	1
M.UN.8	Visualize and describe the relative sizes of one square inch and one square centimeter.	1
M.TE	Techniques and formulas for measurement	2
M.TE.1	Estimate the perimeter of a square and rectangle in inches and centimeters; estimate the area of a square and rectangle in square inches and square centimeters.	2
M.PS	Problem solving involving measurement	2
M.PS.1	Add and subtract lengths, weights and times using mixed units, within the same measurement system.	2
M.PS.2	Add and subtract money in dollars and cents.	1
M.PS.3	Solve applied problems involving money, length and time.	2
M.PS.4	Solve contextual problems about perimeters of rectangles and areas of rectangular regions.	2
G	Geometry	2
G.GS	Geometric shape, properties, and mathematical arguments	1
G.GS.1	Identify points, line segments, lines and distance.	1
G.GS.2	Identify perpendicular lines and parallel lines in familiar shapes and in the classroom.	1
G.GS.3	Identify parallel faces of rectangular prisms, in familiar shapes and in the classroom.	1
G.GS.4	Identify, describe, compare and classify two-dimensional shapes based on their component parts (angles, sides, vertices, line segment) and the number of sides and vertices.	2
G.GS.5	Identify, describe, build and classify familiar three-dimensional solids based on their component parts (faces, surfaces, bases, edges, vertices).	3
G.SR	Spatial reasoning and geometric modeling	2
G.SR.1	Compose and decompose triangles and rectangles to form other familiar two-dimensional shapes.	2
G.SR.2	Represent front, top, and side views of solids built with cubes.	2
D	Data & Probability	2
D.RE	Data representation	2
D.RE.1	Read and interpret bar graphs, in both horizontal and vertical forms.	2
D.RE.2	Read scales on the axes and identify the maximum, minimum, and range of values in a bar graph.	2

Table 4.12
Group Consensus
MI Mathematics Grade 3, Mathematics, Grade 3

D.RE.3	Solve problems using information in bar graphs, including comparison of bar graphs.	2

Table 5.12
Group Consensus
MI Mathematics Grade 4, Mathematics, Grade 4

Level	Description	DOK
N	Number & Operations	2
N.ME	Meaning, notation, place value, and comparisons	1
N.ME.1	Read and write numbers to 1,000,000; relate them to the quantities they represent; compare and order.	1
N.ME.2	Compose and decompose numbers using place value to 1,000,000's.	1
N.ME.3	Understand the magnitude of numbers up to 1,000,000; recognize the place value's of numbers, and the relationship of each place value to the place to its right.	1
N.ME.4	Find all factors of a whole number up to 50, and list factor pairs.	2
N.ME.5	List the first ten multiples of a given one-digit whole number; determine if a whole number is a multiple of a given one-digit whole number, and if a one-digit number is a factor of a given whole number.	2
N.ME.6	Multiply two-digit numbers by 2, 3, 4, and 5, using the distributive property.	2
N.ME.7	Read and interpret decimals up to two decimal places; relate to money and place value decomposition.	1
N.ME.8	Know that terminating decimals represent fractions whose denominators are 10, 10 x 10, 10 x 10 x 10, etc.	1
N.ME.9	Locate tenths and hundredths on a number line.	1
N.ME.10	Read, write, interpret, and compare decimals up to two decimal places.	2
N.ME.11	Understand fractions as parts of a set of objects.	1
N.MR	Number relationships and meaning or operations	2
N.MR.1	Know that some numbers, including 2, 3, 5, 7, and 11 have exactly two factors (1 and the number itself) and are called prime numbers.	1
N.MR.2	Solve problems about factors and multiples.	2
N.MR.3	Use the relationship between multiplication and division to simplify computations and check results.	1
N.MR.4	Write tenths and hundredths in decimal and fraction forms, and know the decimal equivalents for halves and fourths.	1
N.MR.5	Explain why equivalent fractions are equal, using models such as fraction strips or the number line, for fractions with denominators of 12 or less, or equal to 100.	2
N.MR.6	Locate and compare fractions on the number line, including improper fractions and mixed numbers with denominators of 12 or less.	2
N.MR.7	Understand the relationships among halves, fourths and eighths and among thirds, sixths and twelfths.	1
N.MR.8	Know that fractions of the form m/n, where m is greater than n, are greater than 1 and are called improper fractions; locate improper fractions on the number line; express as mixed numbers.	1
N.MR.9	Write improper fractions as mixed numbers, and understand that a mixed number represents the number of "wholes" and the part of a whole remaining.	1
N.MR.10	Compare and order up to three fractions with denominators 2, 4, and 8, and 3, 6, and 12, including improper fractions and mixed numbers.	2
N.MR.1	Add and subtract fractions less than 1 with denominators 12 or less and including 100, in	2

Table 5.12
Group Consensus
MI Mathematics Grade 4, Mathematics, Grade 4

1	cases where the denominators are equal or when one denominator is a multiple of the other.	
N.MR.12	Solve for the unknown in equations such as: 1/8 + x = 5/8 or 3/4 - y = 1/2.	2
N.MR.13	Multiply fractions by whole numbers, using repeated addition and area or array models.	2
N.MR.14	Use mathematical statements to represent problems that use addition and subtraction of decimals with up to two-digits; solve.	2
N.MR.15	Solve applied problems using the four basic arithmetic operations, for appropriate fractions, decimals, and whole numbers.	2
N.FL	Fluency with operations and estimation	2
N.FL.1	Add and subtract whole numbers fluently.	1
N.FL.2	Multiply fluently any whole number by a one-digit number, and a three-digit number by a two-digit number; for two-digit by one-digit multiplication, use distributive property to develop meaning for the algorithm.	2
N.FL.3	Divide numbers up to four-digits by one-digit numbers and by 10.	1
N.FL.4	Find unknowns in equations such as	2
N.FL.5	Solve applied problems involving whole number multiplication and division.	2
N.FL.6	Solve fraction problems involving sums and differences for fractions where one denominator is a multiple of the other (denominators 2 through 12, and 100).	2
N.FL.7	Add and subtract decimals up to two decimal places.	1
N.FL.8	Multiply and divide decimals up to two decimal places by a one-digit whole number where the result is a terminating decimal.	1
N.FL.9	Estimate the answers to calculations involving addition, subtraction, or multiplication.	2
N.FL.10	Know when approximation is appropriate and use it to check the reasonableness of answers; be familiar with common place-value errors in calculations.	2
N.FL.11	Make appropriate estimations & calculations	2
M	Measurement	2
M.UN	Units and systems or measurement	2
M.UN.1	Measure using common tools and select appropriate units of measure.	1
M.UN.2	Measure and compare integer temperatures in degrees.	1
M.UN.3	Give answers to a reasonable degree of precision in the context of a given problem.	2
M.UN.4	Solve contextual problems about perimeter and area of squares and rectangles in compound shapes.	2
M.UN.5	Solve contextual problems about surface area.	2
M.TE	Techniques and formulas for measurement	2
M.TE.1	Measure surface area of cubes and rectangular prisms by covering and counting area of the faces.	2
M.TE.2	Carry out the following conversions from one unit of measure to a larger or smaller unit of measure: meters to centimeters, kilograms to grams, liters to milliliters, hours to minutes, minutes to seconds, years to months, weeks to days, feet to inches, ounces to pounds (using numbers that involve only simple calculations.)	1
M.TE.3	Know and understand the formulas for perimeter and area of a square and a rectangle; calculate the perimeters and areas of these shapes and combinations of these shapes using	2

Table 5.12
Group Consensus
MI Mathematics Grade 4, Mathematics, Grade 4

	the formulas.	
M.TE.4	Find one dimension of a rectangle given the other dimension and its perimeter or area.	2
M.TE.5	Find the side of a square given its perimeter or area.	1
M.TE.6	Identify right angles and compare angles to right angles.	1
G	Geometry	2
G.GS	Geometric shape, properties, and mathematical arguments	2
G.GS.1	Identify and draw perpendicular, parallel, and intersecting lines using a ruler and a tool or object with a square (90°) corner.	1
G.GS.2	Identify basic geometric shapes, including isosceles, equilateral and right triangles, and use their properties to solve problems.	2
G.SR	Spatial reasoning and geometric modeling	1
G.SR.1	Identify and count the faces, edges, and vertices of basic three-dimensional geometric solids including cubes, rectangular prisms, and pyramids; describe the shape of their faces.	1
G.TR	Transformation and symmetry	1
G.TR.1	Recognize plane figures that have line symmetry.	1
G.TR.2	Recognize rigid motion transformations (flips, slides, turns) of a two-dimensional object.	1
D	Data & Probability	2
D.RE	Data representation	2
D.RE.1	Construct tables and bar graphs from given data.	2
D.RE.2	Order a given set of data, find the median, and specify the range of values.	2
D.RE.3	Solve problems using data presented in tables and bar graphs; read bar graphs showing two data sets.	2

Table 6.12
Group Consensus
MI Mathematics Grade 5, Mathematics, Grade 5

Level	Description	DOK
N	Number & Operations	1
N.ME	Meaning, notation, place value, and comparisons	1
N.ME.1	Understand the relative magnitude of ones, tenths, and hundredths and the relationship of each place value to the place to its right.	1
N.ME.2	Understand percentages as parts out of 100, use % notation, and express a part of a whole as a percentage.	1
N.ME.3	Understand a fraction as a statement of division using simple fractions and pictures to represent.	1
N.ME.4	Given two fractions, express them as equivalent fractions with a common denominator, but not necessarily a least common denominator.	1
N.ME.5	Express ratios in several ways, given applied situations; recognize and find equivalent ratios.	2
N.FL	Fluency with operations and estimation	2
N.FL.1	Multiply a multi-digit number by a two-digit number; recognize and be able to explain common computational errors such as not accounting for place value.	2
N.FL.2	Divide fluently up to a four-digit number by a two-digit number.	1
N.FL.3	Divide a fraction by a whole number and a whole number by a fraction, using simple unit fractions.	1
N.FL.4	Add and subtract fractions with unlike denominators of 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12 and 100, using the common denominator that is the product of the denominators of the 2 fractions.	1
N.FL.5	Given an applied situation involving addition and subtraction of fractions, write mathematical statements describing the situation.	2
N.FL.6	Solve applied problems involving fractions and decimals; include rounding of answers and checking reasonableness; use examples involving money.	2
N.MR	Number relationships and meaning or operations	1
N.MR.1	Understand the meaning of division of whole numbers, with and without remainders; relate division to fractions and to repeated subtraction.	1
N.MR.2	Relate division of whole numbers with remainders to the form a = bq + r.	1
N.MR.3	Write mathematical statements involving division for given situations.	2
N.MR.4	Solve applied problems involving multiplication and division of whole numbers.	2
N.MR.5	Find the prime factorization of numbers between 1 and 50, express in exponential notation, and understand that every whole number can be expressed as a product of primes.	2
N.MR.6	Find the product of two unit fractions with small denominators using area model.	1
N.MR.7	Multiply a whole number by powers of 10: 0.01, 0.1, 1, 10, 100, and 1000; identify patterns.	1
N.MR.8	Multiply one-digit and two-digit whole numbers by decimals up to two decimal places.	1
N.MR.9	Solve word problems that involve finding sums and differences of fractions with unlike denominators, using knowledge of equivalent fractions.	2
N.MR.10	Solve for the unknown in such equations as: 1/4 + x = 7/12.	2
N.MR.1	Express fractions and decimals as percentages, and vice versa.	1

Table 6.12
Group Consensus
MI Mathematics Grade 5, Mathematics, Grade 5

1		
M	Measurement	2
M.UN	Units and systems or measurement	1
M.UN.1	Recognize the equivalence of 1 liter, 1000 ml and 1000 cm3 and include conversions among liters, milliliters, and cubic centimeters.	1
M.UN.2	Know the units of measure of volume: cubic centimeter, cubic meter, cubic inches, cubic feet, cubic yards, and use their abbreviations: cm3, m3, in3, ft3, yd3.	1
M.UN.3	Compare the relative sizes of one cubic inch to one cubic foot, and one cubic centimeter to one cubic meter.	1
M.UN.4	Convert measurements of length, weight, area, volume, and time within a given system, using easily manipulated numbers.	1
M.PS	Problem solving involving measurement	2
M.PS.1	Represent relationships between areas of rectangles, triangles and parallelograms using models.	2
M.PS.2	Solve applied problems about the volumes of rectangular prisms using multiplication and division and using the appropriate units.	2
M.TE	Techniques and formulas for measurement	2
M.TE.1	Understand and know how to use the area formula of a triangle: A = 1/2(bh) (where b is length of the base and h is the height), and represent using models and manipulatives.	2
M.TE.2	Understand and know how to use the area formula for a parallelogram: A = bh, and represent using models and manipulatives.	2
G	Geometry	2
G.GS	Geometric shape, properties, and mathematical arguments	2
G.GS.1	Measure angles with a protractor and classify them as acute, right, obtuse or straight.	1
G.GS.2	Identify and name angles on a straight line and vertical angles.	1
G.GS.3	Find unknown angles in problems involving angles on a straight line, angles surrounding a point and vertical angles.	2
G.GS.4	Know that angles on a straight line add up to 180° and angles surrounding a point add up to 360°; justify informally by "surrounding" a point with angles.	1
G.GS.5	Understand why the sum of the interior angles of a triangle is 180° and the sum of the interior angles of a quadrilateral is 360°, and use these properties to solve problems.	2
G.GS.6	Find unknown angles using the properties of: triangles, including right, isosceles, and equilateral triangles; parallelograms, including rectangles and rhombuses; and trapezoids.	2
G.TR	Transformation and symmetry	1
G.TR.1	Associate an angle with a certain amount of turning; know that angles are measured in degrees; understand that 90°, 180°, 270°, and 360° are associated, respectively, with 1/4, 1/2, 3/4, and full turns.	1
D	Data & Probability	2
D.RE	Data representation	2
D.RE.1	Read and interpret line graphs, and solve problems based on line graphs, time graphs, and problems with two or three line graphs on same axes, comparing different data.	2
D.RE.2	Construct line graphs from tables of data; include axis labels and scale.	2
D.AN	Data interpretation and analysis	2
D.AN.1	Given a set of data, find and interpret the mean (using the concept of fair share) and	2

Table 6.12
Group Consensus
MI Mathematics Grade 5, Mathematics, Grade 5

	mode.	
D.AN.2	Solve multi-step problems involving means.	2

Table 7.12
Group Consensus
MI Mathematics Grade 6, Mathematics, Grade 6

Level	Description	DOK
N	Number & Operations	1
N.ME	Meaning, notation, place value, and comparisons	1
N.ME.1	Order rational numbers and place them on the number line.	1
N.ME.2	Represent rational numbers as fractions or terminating decimals when possible, and translate between these representations.	1
N.ME.3	Understand that a fraction or a negative fraction is a quotient of two integers.	1
N.ME.4	Find equivalent ratios by scaling up or scaling down.	1
N.ME.5	Understand and use integer exponents, excluding powers of negative numbers; express numbers in scientific notation.	1
N.ME.6	Locate negative rational numbers (including integers) on the number line; know that numbers and their negatives add to 0, and are on opposite sides and at equal distance from 0 on a number line.	1
N.ME.7	Understand that rational numbers are quotients of integers (non-zero denominators).	1
N.ME.8	Understand that 0 is an integer that is neither negative nor positive.	1
N.ME.9	Know that the absolute value of a number is the value of the number, ignoring the sign; or is the distance of the number from 0.	1
N.FL	Fluency with operations and estimation	2
N.FL.1	Given an applied situation involving dividing fractions, write a mathematical statement to represent the situation.	2
N.FL.2	Multiply and divide any two fractions, including mixed numbers, fluently.	1
N.FL.3	Add, subtract, multiply, and divide integers between -10 and 10; use number line and strip models for addition and subtraction.	1
N.FL.4	Add, subtract, multiply and divide positive rational numbers fluently.	1
N.FL.5	Calculate part of a number given the percentage and the number.	1
N.FL.6	Solve word problems involving percentages in such contexts as sales taxes and tips, and involving positive rational numbers.	2
N.FL.7	For applied situations, estimate the answers to calculations involving operations with rational numbers.	2
N.FL.8	Solve applied problems that use the four operations with appropriate decimal numbers.	2
N.MR	Number relationships and meaning or operations	1
N.MR.1	Understand division of fractions as the inverse of multiplication.	1
N.MR.2	Solve for the unknown in equations such as: 1/4 ÷ _ = 1, 3/4 ÷ _ = 1/4, and 1/2 = 1 x _.	2
N.MR.3	Understand integer subtraction as the inverse of integer addition; add and subtract integers, using integers from 10 to -10.	1
A	Algebra	2
A.PA	Patterns, relations, functions, and change	2
A.PA.1	Solve applied problems involving rates, including speed.	2
A.PA.2	Graph and write equations for linear functions of the form y = mx and solve related problems.	2
A.FO	Formulas, expressions, equations, and inequities	1
A.FO.1	Use letters, with units, to represent quantities in a variety of contexts.	1
A.FO.2	Distinguish between an algebraic expression and an equation.	1
A.FO.3	Use standard conventions for writing algebraic expressions.	1

Table 7.12
Group Consensus
MI Mathematics Grade 6, Mathematics, Grade 6

A.FO.4	Represent information given in words using algebraic expressions and equations.	2
A.FO.5	Simplify expressions of the first degree by combining like terms, and evaluate using specific values.	2
A.FO.6	Relate simple linear equations with integer coefficients to particular contexts.	2
A.FO.7	Understand that adding or subtracting the same number to both sides of an equation creates a new equation that has the same solution.	1
A.FO.8	Understand that multiplying or dividing both sides of an equation by the same non-zero number creates a new equation that has the same solutions.	1
A.FO.9	Solve equations of the form ax + b = c, by hand for positive integer coefficients less than 20, using calculators otherwise, and interpret the results.	2
A.RP	Representation	1
A.RP.1	Understand that graphs and tables can suggest relationships between quantities.	1
A.RP.2	Represent simple relationships between quantities.	2
A.RP.3	Plot ordered pairs of integers and use ordered pairs of integers to identify points in all four quadrants of the coordinate plane.	1
M	Measurement	2
M.UN	Units and systems or measurement	1
M.UN.1	Convert between basic units of measurement within a single measurement system.	1
M.PS	Problem solving involving measurement	2
M.PS.1	Draw patterns (of faces) for a cube and rectangular prism that, when cut, will cover the solid exactly (nets).	2
M.TE	Techniques and formulas for measurement	2
M.TE.1	Compute the volume and surface area of cubes and rectangular prisms given the lengths of their sides, using formulas.	2
G	Geometry	2
G.GS	Geometric shape, properties, and mathematical arguments	2
G.GS.1	Understand and apply basic properties of lines, angles, and triangles, including: • triangle inequality, • relationships of vertical angles, complementary angles, supplementary angles, • congruence of corresponding and alternate interior angles when parallel lines are cut by a transversal, and that such congruencies imply parallel lines • locate interior and exterior angles of any triangle and use the property that a exterior angle of a triangle is equal to the sum of the remote (opposite) interior angles • know that the sum of the exterior angles of a convex polygon is 360 degrees	2
G.GS.2	Understand that for polygons, congruence means corresponding sides and angles have equal measures.	1
G.TR	Transformation and symmetry	2
G.TR.1	Understand the basic rigid motions in the plane (reflections, rotations, translations), relate these to congruence, and apply them to solve problems.	2
G.TR.2	Understand and use simple compositions of basic rigid transformations.	2
D	Data & Probability	2
D.PR	Probability	2
D.PR.1	Express probabilities as fractions, decimals or percentages between 0 and 1; know that 0 probability means an event will not occur, and that probability 1 means an event will	1

Table 7.12
Group Consensus
MI Mathematics Grade 6, Mathematics, Grade 6

	occur.	
D.PR.2	Compute probabilities of events from simple experiments with equally likely outcomes by listing all possibilities and finding the fraction that meets given conditions.	2

Table 7.12
Group Consensus
MI Mathematics Grade 6, Mathematics, Grade 6

Level	Description	DOK
N	Number & Operations	2
N.ME	Meaning, notation, place value, and comparisons	2
N.ME.1	Understand derived quantities such as density, velocity, and weighted averages.	2
N.FL	Fluency with operations and estimation	2
N.FL.1	Solve problems involving derived quantities.	2
N.FL.2	Calculate rates of change, including speed.	2
N.FL.3	Solve simple proportion problems using such methods as unit rate, scaling, finding equivalent fractions, and solving the proportion equation a/b = c/d; know how to see patterns about proportional situations in tables.	2
N.FL.4	Solve problems involving operations with integers.	2
N.FL.5	Add, subtract, multiply and divide negative rational numbers.	1
N.FL.6	Estimate results of computations with rational numbers.	2
N.MR	Number relationships and meaning or operations	2
N.MR.1	Convert ratio quantities between different systems of units, such as feet per second to miles per hour.	2
N.MR.2	Understand the concept of square root and cube root, and estimate using calculators.	2
A	Algebra	2
A.PA	Patterns, relations, functions, and change	2
A.PA.1	Recognize when information given in a table, graph or formula suggests a proportional or linear relationship.	1
A.PA.2	Given a directly proportional or linear situation, graph and interpret the slope and intercept(s) in terms of the original situation; evaluate y = kx for specific x values, given k.	2
A.PA.3	For directly proportional or linear situations, solve applied problems using graphs and equations.	2
A.PA.4	Understand and use directly proportional relationships of the form y = mx, and distinguish from linear relationships of the form y = mx + b, b non-zero; understand that in a directly proportional relationship between two quantities one quantity is a const	2
A.PA.5	Calculate the slope from the graph of a linear function as the ratio of “rise/run” for a pair of points on the graph, and express the answer as a fraction and a decimal; understand that linear functions have slope that is a constant rate of change.	2
A.PA.6	Represent linear functions in the form y = x + b, y = mx, and y = mx + b, and graph, interpreting slope and y-intercept.	2
A.PA.7	Recognize inversely proportional relationships in contextual situations; know that quantities are inversely proportional if their product is constant, and that an inversely proportional relationship is of the form y = k/x where k is some non-zero number.	2
A.PA.8	Understand and use basic properties of real numbers: additive and multiplicative identities, additive and multiplicative inverses, commutativity, associativity, and the distributive property of multiplication over addition.	2
A.RP	Representation	2
A.RP.1	Represent directly proportional and linear relationships using verbal descriptions, tables, graphs and formulas, and translate among these representations.	2
A.RP.2	Know that the graph of y = k/x is not a line; know its shape, and know that it crosses	1

Table 7.12
Group Consensus
MI Mathematics Grade 6, Mathematics, Grade 6

	neither the x nor the y-axis.	
A.FO	Formulas, expressions, equations, and inequities	2
A.FO.1	Know that the solution to a linear equation corresponds to the point at which its graph crosses the x-axis.	1
A.FO.2	Add, subtract and multiply simple algebraic expressions of the first degree, and justify using properties of real numbers.	2
A.FO.3	From applied situations, generate and solve linear equations of the form ax + b = c and ax + b = cx + d, and interpret solutions.	2
G	Geometry	2
G.SR	Spatial reasoning and geometric modeling	1
G.SR.1	Use a ruler and other tools to draw squares, rectangles, triangles and parallelograms with specified dimensions.	1
G.TR	Transformation and symmetry	2
G.TR.1	Understand that in similar polygons, corresponding angles are congruent and the ratios of corresponding sides are equal; understand the concepts of similar figures and scale factor.	2
G.TR.2	Solve problems about similar figures and scale drawings.	2
G.TR.3	Show that two triangles are similar using the criteria: corresponding angles are congruent (AAA similarity); the ratios of two pairs of corresponding sides are equal and the included angles are congruent (SAS similarity); ratios of all pairs of correspond	2
G.TR.4	Understand and use the fact that when two triangles are similar with scale factor of r, their areas are related by a factor of r2.	2
D	Data & Probability	2
D.RE	Data representation	3
D.RE.1	Represent and interpret data using circle graphs, stem and leaf plots, histograms, and box-and-whisker plots, and select appropriate representation to address specific questions.	3
D.AN	Data interpretation and analysis	2
D.AN.1	Create and interpret scatter plots and use an estimated line of best fit to answer questions about the data.	2
D.AN.2	Calculate and interpret relative frequencies and cumulative frequencies for given data sets.	2
D.AN.3	Find and interpret the median, quartiles, and interquartile range of a given set of data.	2

Appendix T.2:

Data Analysis Tables
Mathematics
Grades 3, 4, 5, 6, 7, and 8

Brief Explanation of Data in the Alignment Tables by Column

Tables (Grade.1

Goals #	Number of objectives plus one for a generic objective for each standard.
Objectives #	Average number of objectives for reviewers. If the number is greater than the actual number in the standard, then at least one reviewer coded an item for the goal/objective but did not find any objective in the goal that corresponded to the item.
Level	The Depth-of-Knowledge level coded by the reviewers for the objectives for each standard.
# of objectives by Level	The number of objectives coded at each level
% w/in std by Level	The percent of objectives coded at each level
Hits Mean & SD	Mean and standard deviation number of items reviewers coded as corresponding to standard. The total is the total number of coded hits.
Cat. Conc. Accept.	"Yes" indicates that the standard met the acceptable level for criterion. "Yes" if mean is six or more. "Weak" if mean is five to six. "No" if mean is less than five.

Tables (Grade).2

	First five columns repeat columns from Table 1.
Level of Item w.r.t. Stand	Mean percent and standard deviation of items coded as "under" the Depth-of-Knowledge level of the corresponding objective, as "at" (the same) the Depth-of-Knowledge level of the corresponding objective, and as "above" the Depth-of-Knowledge level of the corresponding objective.
Depth-of-Know. Consistency Accept.	"Yes" indicates that 50% or more of the items were rated as "at" or "above" the Depth-of-Knowledge level of the corresponding objectives. "Weak" indicates that 40% to 50% of the items were rated as "at" or "above" the Depth-of-Knowledge level of the corresponding objectives. "No" indicates that less than 40% items were rated as "at" or "above" the Depth-of-Knowledge level of the corresponding objectives.

Tables (Grade).3

First five columns repeat columns from Table 1 and 2.

Range of Objectives	
# Objectives Hit	Average number and standard deviation of the objectives hit coded by reviewers.
% of Total	Average percent and standard deviation of the total objectives that had at least one item coded.
Range of Know. Accept.	"Yes" indicates that 50% or more of the objectives had at least one coded objective. "Weak" indicates that 40% to 50% of the objectives had at least one coded objective. "No" indicates that 40% or less of the objectives had at least one coded objective.
Balance Index	
% Hits in Std/Ttl Hits	Average and standard deviation of the percent of the items hit for a standard of total number of hits (see total under the Hits column).
Index	Average and standard deviation of the Balance Index.

Note: BALANCE INDEX $1 - (\sum_{k=1} \left| 1/(O) - I_{(k)}/(H) \right|)/2$

Where O = Total number of objectives hit for the standard

$I_{(k)}$ = Number of items hit corresponding to objective (k)

H = Total number of items hit for the standard

Bal. of Rep Accept.	"Yes" indicates that the Balance Index was .7 or above (items evenly distributed among objectives). "Weak" indicates that the Balance Index was .6 to .7 (a high percentage of items coded as corresponding to two or three objectives). "No" indicates that the Balance Index was .6 or less (a high percentage of items coded as corresponding to one objective.)

Tables (Grade).4

Summary if standard met the acceptable level for the four criteria by each standard.

Tables (Grade). 5

Comments made by reviewers on items identified as having a source of challenge issue by item number.

Tables (Grade).6

The DOK value for each assessment item given by each reviewer. The intraclass correlation for the group of reviewers is given on the last row.

Tables (Grade).7

All notes made by reviewers on items by item number.

Tables (Grade).8

The DOK level and objective code assigned by each reviewer for each item.

Tables (Grade).9

This list all of the objectives coded to each item by the reviewers as corresponding to the item. Repeat of an objective indicates the number of reviewers who coded that objective as corresponding to the item.

Tables (Grade).10

This lists for each objective all of the items coded by the reviewers as corresponding to the objective. Repeat of an item indicates the number of reviewers who coded the item as corresponding to the objective.

Tables (Grade).11

This table summarizes the number of reviewers who coded an item as corresponding to an objective. It contains the same information as in Table 10.

Tables (Grade).12

This table does not appear here, but in Appendix A. It shows the DOK levels determined by the consensus process assigned to each objective.

Tables (Grade).13

This table can be used to compare the DOK level of an objective to the average DOK level of the items reviewers assigned to the objective. This table is helpful to identify items with a lower DOK level that should be replaced by an item with a higher DOK level to improve the Depth-of-Knowledge Consistency.

Table 3.1
Categorical Concurrence Between Standards and Assessment as Rated by Twelve Reviewers
Michigan Grade 3 Mathematics
Number of Assessment Items - 63

Standards			Level by Objective			Hits		Cat. Concurr.
Title	Goals #	Objs #	Level	# of objs by Level	% w/in std by Level	Mean	S.D.	
N - Number & Operations	3	20.58	1 2 3	7 10 2	36 52 10	34.5	3.28	YES
M - Measurement	3	10.58	1 2	4 6	40 60	21.08	3.93	YES
G - Geometry	4	7.08	1 2 3	2 3 2	28 42 28	11.08	0.28	YES
D - Data & Probability	1	3	2	3	100	0	0	NO
Total	11	41.25	1 2 3	13 22 4	33 56 10	66.67	3.82	

Table 3.2
Depth-of-Knowledge Consistency Between Standards and Assessment as Rated by Twelve Reviewers
Michigan Grade 3 Mathematics
Number of Assessment Items - 63

Standards			Hits		Level of Item w.r.t. Standard						DOK Consistency
					% Under		% At		% Above		
Title	Goals #	Objs #	M	S.D.	M	S.D.	M	S.D.	M	S.D.	
N - Number & Operations	3	20.58	34.5	3.28	40	44	56	43	4	16	YES
M - Measurement	3	10.58	21.08	3.93	34	40	62	39	4	12	YES
G - Geometry	4	7.08	11.08	0.28	45	45	49	44	6	23	YES
D - Data & Probability	1	3	0	0	0	0	0	0	0	0	NO
Total	11	41.25	66.67	3.82	39	43	56	43	4	17	

Table 3.3
Range-of-Knowledge Correspondence and Balance of Representation Between Standards and Assessment as Rated by Twelve Reviewers
Michigan Grade 3 Mathematics
Number of Assessment Items - 63

Standards			Hits		Range of Objectives				Rng. of Know.	Balance Index				Bal. of Represent.
					# Objs Hit		% of Total			% Hits in Std/Ttl Hits		Index		
Title	Goals #	Objs #	Mean	S.D.	Mean	S.D.	Mean	S.D.		Mean	S.D.	Mean	S.D.	
N - Number & Operations	3	20.58	34.5	3.28	13.58	1.44	66	7	YES	52	5	0.79	0.03	YES
M - Measurement	3	10.58	21.08	3.93	7.08	0.76	67	7	YES	32	5	0.80	0.05	YES
G - Geometry	4	7.08	11.08	0.28	4.58	0.76	65	10	YES	17	1	0.80	0.05	YES
D - Data & Probability	1	3	0	0	0	0	0	0	NO	0	0	0	0	NO
Total	11	41.25	66.67	3.82	6.31	3.93	49	8		25	15	0.60	0.05	

Table 3.4
Summary of Attainment of Acceptable Alignment Level on Four Content Focus Criteria as Rated by Twelve Reviewers
Michigan Grade 3 Mathematics
Number of Assessment Items - 63

Standards	Alignment Criteria			
	Categorical Concurrence	Depth-of-Knowledge Consistency	Range of Knowledge	Balance of Representation
N - Number & Operations	YES	YES	YES	YES
M - Measurement	YES	YES	YES	YES
G - Geometry	YES	YES	YES	YES
D - Data & Probability	NO	NO	NO	NO

Table 3.5
Source-of-Challenge Issues by Reviewer
Michigan Grade 3 Mathematics

Item Number	Comments by Reviewer
5	This problem is a three digit plus a three digit which requires regrouping... no GLCE aligns to this.
6	This reads awkwardly. Use a context for growth of plant or board length.
12	This is a three digit minus a two digit problem. The GLCES say that at most two digits should be used.
20	I could find the correct answer by adding up the available anwsers and adding up the number of cars without going through the process the item is supposed to be coded at
20	The question asks students to pick a way that may involve multiplication but doesn't offer that as an option.
28	The wording of the questions makes it seem open ended when it is not. A child could choose many ways to regroup the chairs that is correct, but their answer is not reflected in the choices.
38	Technically the blocks are pink not grey. As the question suggest
38	The question asks which fractions show the number of blocks that are gray.... yet the shaded blocks are red. This could be confusing to some students.
38	The color in the booklet is red and the question says gray.
45	The reduced size of the coins is misleading. The students need to recognize the value of the coins not by size, but by the picture on the coin. This may be misleading.
54	The questions says gray when the color is red
56	The question states gray and the picture show red.
69	"Same shape" is misleading. Both B and C are the same shape-ellipses. Only C is the same sized ellipse.
69	VOCAB SHAPE VS SIZE

Table 3.6
Depth-of-Knowledge Levels by Item and Reviewers
Intraclass Correlation
Michigan Grade 3 Mathematics

Item	Rater 1	Rater 2	Rater 3	Rater 4	Rater 5	Rater 6	Rater 7	Rater 8	Rater 9	Rater 10	Rater 11	Rater 12
1	1	1	2	1	1	1	1	1	2	1	1	1
2	1	1	1	1	1	1	1	1	2	2	1	1
3	1	1	1	1	1	1	1	1	2	2	1	1
4	2	2	2	2	2	2	2	2	2	2	2	2
5	1	1	1	1	1	1	1	1	1	1	1	1
6	1	1	2	2	2	1	1	2	1	1	1	1
7	1	1	1	1	1	1	1	2	2	2	1	1
8	1	2	2	2	2	2	2	2	2	2	1	2
9	1	1	1	1	1	1	1	1	2	1	1	1
10	1	1	1	1	1	1	1	1	1	1	1	1
11	1	1	1	1	1	1	1	1	2	1	1	1
12	1	2	2	1	2	2	2	2	2	2	1	1
13	1	1	1	2	1	1	1	1	1	1	1	1
14	1	2	2	2	2	2	2	2	2	2	1	2
15	1	1	1	1	1	1	1	1	1	1	1	1
16	1	2	1	1	2	2	2	1	2	2	1	1
17												
18												
19	1	1	1	1	1	1	1	1	1	1	1	1
20	1	1	1	1	1	1	1	1	1	1	1	1
21	1	1	1	1	1	1	1	1	1	1	1	1
22	1	2	1	1	1	1	1	1	1	2	1	1
23	2	2	2	2	2	2	2	1	2	2	2	1
24	1	1	2	2	2	2	2	2	2	2	1	2
25	1	1	2	2	2	2	2	2	2	2	1	2
26	2	1	1	1	1	1	1	1	2	1	1	1
27	1	1	1	1	1	1	1	2	1	1	1	1
28	1	1	2	1	2	2	2	1	1	2	2	1
29	1	1	1	1	1	1	1	1	1	1	1	1
30	1	1	1	1	1	1	1	1	1	1	1	1
31	1	1	2	2	1	1	1	1	2	2	1	1
32	1	1	1	2	1	1	1	1	2	2	1	1
33	2	1	2	1	2	2	2	2	1	2	1	2
34	1	1	1	1	2	2	1	1	1	1	1	1
35	1	1	1	1	2	2	1	2	2	2	2	1
36												
37												
38	1	2	1	1	1	1	1	2	1	1	1	2
39	1	2	1	1	1	1	1	2	2	1	1	2
40	1	1	1	1	1	1	1	1	1	1	1	1
41	1	1	1	1	1	1	1	1	1	1	1	1
42	1	1	1	2	1	2	1	1	2	2	2	1
43	1	1	1	1	1	1	1	1	1	1	1	1
44	1	1	1	1	1	1	1	1	1	1	1	1
45	1	2	2	2	2	1	1	1	1	2	1	1
46	1	1	2	2	2	2	1	1	2	2	2	2
47	1	2	1	1	2	2	2	2	2	2	1	2
48	1	1	1	1	1	1	1	1	1	1	1	1
49	1	1	1	2	1	1	1	1	2	1	2	1
50	1	1	1	1	1	1	1	1	1	1	1	1
51	2	2	2	2	1	2	1	2	2	2	1	2
52	1	2	2	1	2	2	2	2	2	2	1	2

Table 3.6
Depth-of-Knowledge Levels by Item and Reviewers
Intraclass Correlation
Michigan Grade 3 Mathematics

53	1	1	1	1	2	2	1	1	1	2	2	2
54	1	1	1	1	1	1	1	2	1	1	1	2
55	1	1	1	1	1	1	1	2	1	1	1	2
56	1	1	1	1	1	1	1	1	1	1	1	1
57	1	2	2	2	2	2	2	2	2	2	1	1
58	2	2	1	2	1	1	1	2	2	1	1	1
59												
60												
61	2	2	2	2	2	2	2	2	2	3	2	2
62	1	1	2	2	1	1	1	1	1	1	1	2
63	2	2	2	2	2	2	2	2	2	2	2	2
64	1	1	1	2	1	1	1	1	2	2	1	1
65	1	2	2	2	2	2	2	2	2	2	2	2
66	1	2	1	2	1	1	1	1	1	1	2	1
67	1	1	2	2	2	2	2	2	2	1	2	2
68	1	1	1	1	1	1	1	1	1	1	1	1
69	1	1	1	2	1	1	1	2	1	1	1	2
70												
71												

Intraclass Correlation: 0.8979
Pairwise Comparison: 0.7268

Table 3.7
Notes by Reviewer
Michigan Grade 3 Mathematics

Item Number	Comments by Reviewer
3	n.mr.3 contextual situation,+, model given, solve
4	could also be considered a word problem - N.PS.3 - but it involves estimation and sums with no regrouping
4	Need to do estimate on own, beyond m.ps.3
5	I would have called this an NFL2 but it has 3-digit rather than 2-digit numbers.
5	This problem uses three digit adding with regrouping, which is not covered in the GLCE's for 2nd grade.
5	numbers are 3 digits not 2
5	This problem asks for the sum of three digits WITH regrouping. The expectations call for sums of three digit numbers without regrouping.
9	says difference (vocab word)
12	This problem involves subtracting a three digit number with regrouping which is not covered in the GLCE's
12	This problem includes a 3 digit number with borrowing. This is not a specific grade level expectation.
12	Regrouping
14	
15	Why so many number line problems?
22	Poor answer choices - students only need to know what "round" means, not the vocabulary word "base".
22	VOCABULARY:BASE NOT NEEDED SINCE THE ONLY CIRCLE APPEARS ON THE CYLINDER.
23	COMMON ATTRIBUTES VS COMPARE G.GS.1
24	ANSWER CHOICES A) 8+5 = 13 B)CORRECT C) 8X5 = 40 MUST KNOW DEFIN. OF PERIMETER
28	? N.MR.4 COUNTING TO MULTIPLY POSSIBLE TO N.MR.5 THE REPRESENTATION IS GIVEN
32	N.ME.2 says to"read" and "write" ???
32	N.ME.2 ? RELATIONSHIP TO QUANTITIES THEY REPRESENT
34	NOT DOK 2 BECAUSE ALL ANSWERS ARE GIVEN AS AM
38	The standards deal exclusively with the representation of unit fractions.
38	DOK 2 BECAUSE OF ANSWER CHOICES
39	The standards deal only with unit fractions.
39	SEE 38
40	MORE COMMON THAN #38 & #39 DOK=1
42	N.MR.5 also seems to fit. But . . . The assessment question does not "say" multiplication and therefore an array model to "represent multiplication" didn't seem like the best choice.

Table 3.7
Notes by Reviewer
Michigan Grade 3 Mathematics

42	QUESTION DOES NOT GO FAR ENOUGH TO RELATE TO MULTIPLICATION.
45	There may be some difficulty in recognizing the dime.
45	Could be understood as reading and writing amounts of money or as adding money.
47	The standards only reads 2-digit numbers, but this was the closest one.
47	This problem involves more than 3 digits and regrouping in the problem which is not addressed in the GLCE's
47	adding 3 digit numbers with regrouping not listed
47	The expectation calls for adding 2 numbers up to two digits each. This problem does not match the expectations.
49	The standard distinguishes between curved and straight but not between open and closed. Nevertheless, it was the closest standard.
50	not whole units
53	M.PS.3 COVERSLENGTH, $ BUT NOT TIME AND M.UN.3 GOES BEYOND INTERPRETING.
54	N.ME.4 also seems to be appropriate
54	IS A UNIT FRACTION. REPRESENTATION IS GIVEN.
58	DOK 1 BECAUSE OF ANSWER CHOICES.
61	WHERE IS ADDITION OF TIME ADDRESSED IN THE GLCES BEYOND M.UN.3
63	SEE #61
66	SIMPLE UNIT FRACTION OF 1/4 = DOK 1

Table 3.8
DOK Levels and Objectives Coded by Each Reviewer
Michigan Grade 3 Mathematics

Item	DOK0	PObj0	S1Obj0	S2Obj0	DOK1	PObj1	DOK2	PObj2	S1Obj2	DOK3	PObj3	S1Obj3	DOK4	PObj4	S1Obj4	DOK5	PObj5	S1Obj5	DOK6	PObj6	DOK7	PObj7	DOK8	PObj8	S1Obj8	DOK9	PObj9	S1Obj9	DOK10	PObj10	S1Obj10	DOK11	PObj11	S1Obj11
1	1	N.FL.2	M.PS.1		1	N.MR.3	2	M.PS.3	N.FL.2	1	M.PS.3		1	M.PS.3		1	N.FL.2		1	N.FL.2	1	M.PS.3	2	M.PS.3		1	N.FL.2		1	N.MR.3	N.FL.2	1	M.PS.1	
2	1	M.PS.2	M.PS.3	M.UN.5	1	N.MR.3	1	M.PS.3	N.FL.2	1	M.PS.3	M.PS.2	1	M.PS.3		1	M.PS.2		1	M.PS.2	1	M.PS.3	2	M.PS.3		2	M.PS.3	M.PS.2	1	M.PS.2	M.PS.3	1	M.PS.3	
3	1	N.FL.2	N.MR.3	N.MR.4	1	N.MR.3	1	N.MR.6	N.FL.2	1	N.MR.3		1	N.MR.7		1	N.MR.7		1	N.MR.7	1	N.MR.7	2	N.MR.7		2	N.FL.3		1	N.MR.3		1	N.MR.7	
4	2	N.FL.3	N.ME.2		2	N.FL.3	2	N.FL.3		2	N.FL.3		2	M.PS.3	N.FL.3	2	N.FL.3		2	N.FL.3	2	N.FL.3	2	M.PS.3	N.FL.3	2	N.FL.3		2	N.FL		2	N.FL.3	
5	1	N.FL			1	N.FL	1	N.FL		1	N.FL		1	N.FL		1	N.FL		1	N.FL	1	N.FL	1	N.FL		1	N.FL		1	N.FL		1	N.FL.2	
6	1	M.PS.1	M.PS.3		1	N.MR.3	2	M.PS.2		2	M.PS.3		2	M.PS.3		1	N.MR.2		1	M.PS.1	2	M.PS.3	1	M.PS.1		1	M.PS.1		1	M.PS.1	M.PS.3	1	M.PS.3	
7	1	M.PS.1	M.PS.3		1	N.MR.3	1	M.PS.3		1	M.PS.1		1	M.PS.3		1	N.MR.2		1	M.PS.1	2	M.PS.3	2	M.PS.1		2	M.PS.3		1	M.PS.3	M.PS.1	1	M.PS.3	
8	1	N.FL.3			2	N.FL.3	2	N.FL.3		2	N.FL.3		2	N.FL.3		2	N.FL.3		2	N.FL.3	2	N.FL.3	2	N.FL.3		2	N.FL.3		1	N.FL		2	N.FL.3	
9	1	M.PS.3	M.PS.1		1	N.MR.3	1	M.PS.3		1	M.PS.1		1	M.PS.3		1	M.PS.3		1	N.FL.2	1	M.PS.1	2	M.PS.1		1	N.FL.2		1	M.PS.3	M.PS.1	1	M.PS.1	
10	1	N.MR.1			1	N.MR.1	1	N.MR.1		1	N.MR.1		1	N.MR.1		1	N.MR.1		1	N.MR.1	1	N.MR.1	1	N.MR.1		1	N.MR.1		1	N.MR.1		1	N.MR.1	
11	1	M.PS.1	M.PS.3		1	N.MR.3	1	M.PS.3		1	M.PS.3		1	M.PS.3		1	M.PS.3		1	M.PS.1	1	M.PS.3	2	M.PS.1		1	M.PS.3		1	M.PS.3	M.PS.1	1	M.PS.3	
12	1	N.MR.3			2	N.FL	2	N.FL		1	N.FL		2	N.FL		2	N.FL		2	N.FL	2	N.FL	2	N.FL		2	N.FL		1	N.MR		1	N.FL	
13	1	N.MR.1			1	N.MR.1	1	N.MR.2		2	N.MR.1		1	N.MR.1		1	N.MR.1		1	N.MR.1	1	N.MR.1	1	N.MR.1		1	N.MR.1		1	N.MR.1		1	N.MR.1	
14	1	N.FL.3			2	N.FL.3	2	N.FL.3		2	N.FL.3		2	N.FL.3		2	N.FL.2	N.FL.3	2	N.FL	2	N.FL	2	N.FL.3		2	N.FL.3		1	N.FL		2	N.FL.3	
15	1	N.MR.1			1	N.MR	1	N.MR.1		1	N.MR.1		1	N.MR.1		1	N.MR.1		1	N.MR.1	1	N.MR.7	1	N.MR.1		1	N.MR.1		1	N.MR.1		1	N.MR.1	
16	1	N.MR.2			2	N.MR.2	1	N.MR.2		1	N.MR.2		2	N.MR.2		2	N.MR.2		2	N.MR.2	1	N.MR.2	2	N.MR.2		2	N.MR.2		1	N.MR.2		1	N.MR.2	
17																																		
18																																		
19	1	G.GS.1			1	G.GS.1	1	G.GS.1		1	G.GS.1		1	G.GS.1		1	G.GS.1		1	G.GS.1	1	G.GS.1	1	G.GS.1		1	G.GS.1		1	G.SR.1		1	G.GS.1	
20	1	N.MR.7			1	N.MR.7	1	N.MR.7		1	N.MR.7		1	N.MR.7		1	N.MR.3		1	N.MR.7	1	N.MR.7	1	N.MR.7		1	N.MR.7	N.MR.3	1	N.MR.7		1	N.MR.7	
21	1	M.UN.3			1	M.UN.3	1	M.UN.3		1	M.UN.3		1	M.UN.3		1	M.UN.3		1	M.UN.3	1	M.UN.3	1	M.UN.3		1	M.UN.3		1	M.UN.3		1	M.UN.3	
22	1	G.GS.1			2	G.GS.1	1	G.GS.1		1	G.GS.1		1	G.GS		1	G.GS.1		1	G.GS.1	1	G.GS.1	1	G.SR.1		2	G.GS.2		1	G.GS.1		1	G.GS.1	

Table 3.8
DOK Levels and Objectives Coded by Each Reviewer
Michigan Grade 3 Mathematics

23	2	G.S R.1			2	G.S R.1	2	G.G S.1		2	G.G S.1		2	G.S R.1		2	G.S R.1		2	G.S R.1	1	G.S R.1	2	G.S R.1		2	G.S R.1		2	G.G S.1		1	G.S R.1	
24	1	G.G S.3			1	G.G S.3	2	G.G S.3		2	G.G S.3		2	G.G S.3		2	G.G S.3	N.FL	2	G.G S.3	2	G.G S.3	2	G.G S.3		2	G.G S.3		1	G.G S.3		2	G.G S.3	
25	1	G.G S.3			1	G.G S.3	2	G.G S.3		2	G.G S.3		2	G.G S.3		2	G.G S.3	N.FL	2	G.G S.3	2	G.G S.3	2	G.G S.3		2	G.G S.3		1	G.G S.3		2	G.G S.3	
26	2	M.U N.5			1	M.U N.5	1	M.U N.5		1	M.U N.5		1	M.U N.5		1	M.U N.5		1	M.U N.5	1	M.U N.5	2	M.U N.5		1	M.U N.5		1	M.U N.5		1	M.U N.5	
27	1	N.M E.2			1	N.M E.2	1	N.M E.2		1	N.M E.2		1	N.M E.2		1	N.M E.2		1	N.M E.2	2	N.M E.2	1	N.M E.2		1	N.M E.2		1	N.M E.2		1	N.M E.3	
28	1	N.M R.4			1	N.M R.4	2	N.M R.5		1	N.M R.4		2	N.M R.5	N.FL .4	2	N.M R.5	N.FL .4	2	N.M R.5	1	N.M R.4	1	N.M E.2		2	N.M R.7		2	N.M R.4		1	N.M R.4	
29	1	M.U N.5			1	M.U N.5	1	M.U N.5		1	M.U N.5		1	M.U N.5		1	M.U N.5		1	M.U N.5	1	M.U N.5	1	M.U N.5		1	M.U N.5		1	M.U N.5		1	M.U N.5	
30	1	N.M E.6			1	N.M E.6	1	N.M E.6		1	N.M E.6		1	N.M E.6		1	N.M E.6		1	N.M E.6	1	N.M E.6	1	N.M E.6		1	N.M E.6		1	N.M E.6		1	N.M E.6	
31	1	G.G S.1			1	G.G S.1	2	G.G S.1		2	G.G S.1		1	G.G S.1		1	G.G S.1		1	G.G S.1	1	G.S R.1	2	G.G S.1		2	G.G S.1		1	G.S R.1		1	G.G S.1	
32	1	N.M E.2			1	N.M E.3	1	N.M E.3		2	N.M E.3		1	N.M E.3		1	N.M E.3		1	N.M E.3	1	N.M E.3	2	N.M E.3		2	N.M E.3		1	N.M E.3		1	N.M E.3	
33	2	N.M R.5			1	N.M R.5	2	N.M R.5		1	M.T E.1	N.M R.5	2	N.M R.5		2	N.M R.5		2	N.M R.5	2	M.T E.1	1	N.M R.5		2	N.M R.5		1	N.M R.5		2	M.T E.1	
34	1	M.U N.3			1	M.U N.3	1	M.U N.2		1	M.U N.3		2	M.U N.3		2	M.U N.3		1	M.U N.3	1	M.U N.3	1	M.U N.3		1	M.U N.3		1	M.U N.3		1	M.U N.3	
35	1	G.G S.3			1	G.G S.3	1	G.G S.3		1	G.G S.3		2	G.G S.3		2	G.G S.3		1	G.G S.3	2	G.G S.3	2	G.G S.3		2	G.G S.3		2	G.G S.3		1	G.G S.3	
36																																	
37																																	
38	1	N.M E.4			2	N.M E	1	N.M E.5		1	N.M E.4		1	N.M E.5		1	N.M E.5		1	N.M E.5	2	N.M E.5	1	N.M E.5		1	N.M E.5		1	N.M E.5		2	N.M E.5	
39	1	N.M E.4			2	N.M E	1	N.M E.5		1	N.M E.4		1	N.M E.5		1	N.M E.3		1	N.M E.5	2	N.M E.5	2	N.M E.5		1	N.M E.5		1	N.M E.5		2	N.M E.5	
40	1	N.M E.5			1	N.M E.5	1	N.M E.5		1	N.M E.4		1	N.M E.5		1	N.M E.3		1	N.M E.5	1	N.M E.5	1	N.M E.5		1	N.M E.5		1	N.M E.5		1	N.M E.5	
41	1	M.U N.1			1	M.U N.1	1	M.U N.1		1	M.U N.1		1	M.U N.1		1	M.U N.1		1	M.U N.1	1	M.U N.1	1	M.U N.1		1	M.U N.1		1	M.U N.1		1	M.U N.1	
42	1	G.G S.3			1	N.M R.6	1	N.M R.5		2	N.M R.5		1	N.M R		2	N.M R.4	N.M R.5	1	N.M R.4	1	N.M R.4	2	N.M R.7		2	N.M R.7		2	N.M R.6		1	N.M R.4	
43	1	N.M E.2			1	N.M E.2	1	N.M E.2		1	N.M E.2		1	N.M E.2		1	N.M E.2		1	N.M E.2	1	N.M E.2	1	N.M E.2		1	N.M E.2		1	N.M E.2		1	N.M E.2	
44	1	N.M E.2			1	N.M E.2	1	N.M E.2		1	N.M E.2		1	N.M E.1		1	N.M E.2		1	N.M E.2	1	N.M E.2	1	N.M E.2		1	N.M E.2		1	N.M E.2		1	N.M E.2	
45	1	M.U N.5	M.P S.2		2	M.P S.2	2	M.P S.2		2	M.P S.2		2	M.P S.2	M.U N.5	1	M.U N.5		1	M.U N.5	1	M.U N.5	1	M.P S.2		2	M.U N.5	M.P S.2	1	M.U N.5		1	M.U N.5	
46	1	G.G S.1			1	G.G S.1	2	G.G S.1		2	G.G S.1		2	G.S R.1		2	G.S R.1		1	G.G S.1	1	G.S R.1	2	G.G S.1		2	G.G S.1		2	G.S R.1		2	G.G S.1	

Table 3.8
DOK Levels and Objectives Coded by Each Reviewer
Michigan Grade 3 Mathematics

47	1	N.FL			2	N.MR.3	1	N.FL.2		1	N.MR		2	N.FL		2	N.FL.1		2	N.FL	2	N.FL	2	N.FL		2	N.FL		1	N.FL		2	N.FL.2	
48	1	M.UN.1			1	M.UN.1	1	M.UN.1		1	M.UN.1		1	M.UN.1		1	M.UN.1		1	M.UN.1	1	M.UN.1	1	M.UN.1		1	M.UN.1		1	M.UN.1		1	M.UN.1	
49	1	G.GS.4			1	G.GS.4	1	G.GS.4		2	G.GS.4		1	G.GS.4		1	G.GS.4		1	G.GS.4	1	G.GS.4	2	G.SR.1		1	G.GS.4		2	G.SR.1		1	G.GS.4	
50	1	M.UN.1			1	N.ME.6	1	M.UN.1	N.ME.6	1	M.UN.1		1	M.UN		1	M.UN		1	M.UN	1	M.UN	1	M.PS.3		1	N.ME.6	M.UN.1	1	M.UN.1		1	N.ME.6	
51	2	N.ME.3			2	N.ME.3	2	N.ME.3		2	N.ME.3		1	N.ME.3		2	N.ME.3		1	N.ME.3	2	N.ME.3	2	N.ME.3		2	N.ME.3		1	N.ME.3		2	N.ME.3	
52	1	M.PS.3	M.PS.2		2	N.MR.3	2	M.PS.3		1	M.PS.3		2	M.PS.3		2	N.MR.3		2	N.MR.3	2	M.PS	2	M.PS.3		2	M.PS.3		1	N.MR.3		2	M.PS.3	
53	1	M.UN.4			1	M.UN.4	1	M.UN.4		1	M.UN.4		2	M.UN.4		2	M.UN.3	M.UN.4	1	M.UN.4	1	M.UN.3	1	M.UN.4		2	M.UN.4		2	M.UN.3		2	M.PS	
54	1	N.ME.5			1	N.ME.4	1	N.ME.5		1	N.ME.5		1	N.ME.5		1	N.ME.5		1	N.ME.5	2	N.ME.5	1	N.ME.4		1	N.ME.4		1	N.ME.6		2	N.ME.4	N.ME.5
55	1	N.ME.6			1	N.ME.6	1	N.ME.6		1	N.ME.6		1	N.ME.6		1	N.ME.6		1	N.ME.6	2	N.ME.5	1	N.ME.6		1	N.ME.6		1	N.ME.6		2	N.MR.1	
56	1	N.ME.5			1	N.ME.4	1	N.ME.5		1	N.ME.4		1	N.ME.5		1	N.ME.5		1	N.ME.5	1	N.ME.5	1	N.ME.4		1	N.ME.5		1	N.ME.5		1	N.ME.4	
57	1	N.ME.3			2	N.ME.3	2	N.ME.3		2	N.ME.3		2	N.ME.3		2	N.ME.3		2	N.ME.3	2	N.ME.3	2	N.ME.3		2	N.ME.3		1	N.ME.3		1	N.ME.3	
58	2	M.UN.3			2	M.UN.3	1	M.UN.3		2	M.UN.3		1	M.UN.3		1	M.UN.3		1	M.UN.3	2	M.UN.3	2	M.UN.3		1	M.UN.3		1	M.UN.3		1	M.UN.3	
59																																		
60																																		
61	2	M.UN.4	N.ME.3		2	M.UN.4	2	M.UN.4		2	M.UN.4		2	M.UN.4		2	M.UN.4	M.UN.3	2	M.UN.4	2	M.UN.3	2	M.UN.4		3	M.UN.4		2	M.UN.4		2	M.UN.3	M.UN
62	1	M.UN.1			1	M.UN.1	2	M.UN.1		2	M.UN.1		1	M.UN.1		1	M.UN.1		1	M.UN.1	1	M.UN.1	1	M.UN.1		1	M.UN.1		1	M.UN.1		2	M.UN.1	
63	2	M.UN.4			2	M.UN.4	2	M.UN.4		2	M.UN.4		2	M.UN.4		2	M.UN.4		2	M.UN.4	2	M.UN.3	2	M.UN.4		2	M.UN.4		2	M.UN.4		2	M.UN.3	M.UN
64	1	N.MR.7			1	N.MR.7	1	N.ME.5		2	N.MR.7		1	N.MR		1	N.MR.4		1	N.ME.4	1	N.MR	2	N.MR.7		2	N.MR.7		1	N.MR.5		1	N.MR	
65	1	M.PS.3			2	N.MR.3	2	M.PS.3		2	M.PS.3		2	M.PS.3		2	N.FL		2	N.FL	2	M.PS.3	2	M.PS.3		2	M.PS.3		2	N.MR.3		2	N.FL.2	
66	1	N.ME.5			2	N.ME.4	1	N.ME.5		2	N.ME.4		1	N.ME.5		1	N.ME.5		1	N.ME.5	1	N.ME.5	1	N.ME.5		1	N.ME.4		2	N.ME.4		1	N.ME.4	
67	1	N.MR.3	N.MR.4		1	N.MR.4	2	N.MR.4		2	N.MR.4		2	N.MR		2	N.MR.7		2	N.MR.7	2	N.MR.7	2	N.MR.7		1	N.MR.4		2	N.MR.4		2	N.MR.7	
68	1	G.GS.4			1	G.GS.4	1	G.GS.4		1	G.GS.4		1	G.GS.4		1	G.GS.4		1	G.GS.4	1	G.GS.4	1	G.SR.1		1	G.GS.4		1	G.GS.4		1	G.GS.4	
69	1	G.TR.1			1	G.GS.1	1	G.TR.1		2	G.TR.1		1	G.TR.1		1	G.SR.1		1	G.GS.1	2	G.TR.1	1	G.TR.1		1	G.TR.1		1	G.SR.1		2	G.TR.1	
70																																		

Table 3.8
DOK Levels and Objectives Coded by Each Reviewer
Michigan Grade 3 Mathematics

71																																		

Pairwise Comparison: 0.6571
Standard Pairwise Comparison: 0.9321

Table 3.9
Objectives Coded to Each Item by Reviewers
Michigan Grade 3 Mathematics

Low		Medium		High
0		11.26761		18

1	N.F L.2	N.F L.2	N.F L.2	N.F L.2	N.F L.2	N.F L.2	N.M R.3	N.M R.3	M.P S.1	M.P S.1
	M.P S.3	M.P S.3	M.P S.3	M.P S.3	M.P S.3					
2	N.F L.2	N.M R.3	M.U N.5	M.P S.2	M.P S.2	M.P S.2	M.P S.2	M.P S.2	M.P S.2	M.P S.3
	M.P S.3	M.P S.3	M.P S.3	M.P S.3	M.P S.3	M.P S.3	M.P S.3	M.P S.3		
3	N.F L.2	N.F L.2	N.F L.3	N.M R.3	N.M R.3	N.M R.3	N.M R.3	N.M R.4	N.M R.6	N.M R.7
	N.M R.7	N.M R.7	N.M R.7	N.M R.7	N.M R.7					
4	N.M E.2	N.F L	N.F L.3	N.F L.3	N.F L.3	N.F L.3	N.F L.3	N.F L.3	N.F L.3	N.F L.3
	N.F L.3	N.F L.3	N.F L.3	M.P S.3	M.P S.3					
5	N.F L	N.F L	N.F L	N.F L	N.F L	N.F L	N.F L	N.F L	N.F L	N.F L
	N.F L	N.F L.2								
6	N.M R.2	N.M R.3	M.P S.1	M.P S.1	M.P S.1	M.P S.1	M.P S.1	M.P S.2	M.P S.3	M.P S.3
	M.P S.3	M.P S.3	M.P S.3	M.P S.3						
7	N.M R.2	N.M R.3	M.P S.1	M.P S.1	M.P S.1	M.P S.1	M.P S.1	M.P S.3	M.P S.3	M.P S.3
	M.P S.3	M.P S.3	M.P S.3	M.P S.3						
8	N.F L	N.F L.3	N.F L.3	N.F L.3	N.F L.3	N.F L.3	N.F L.3	N.F L.3	N.F L.3	N.F L.3
	N.F L.3	N.F L.3								
9	N.F L.2	N.F L.2	N.M R.3	M.P S.1	M.P S.1	M.P S.1	M.P S.1	M.P S.1	M.P S.1	M.P S.3
	M.P S.3	M.P S.3	M.P S.3	M.P S.3						
10	N.M R.1	N.M R.1	N.M R.1	N.M R.1	N.M R.1	N.M R.1	N.M R.1	N.M R.1	N.M R.1	N.M R.1
	N.M	N.M								

Table 3.9
Objectives Coded to Each Item by Reviewers
Michigan Grade 3 Mathematics

	R.1	R.1								
11	N.M R.3	M.P S.1	M.P S.1	M.P S.1	M.P S.1	M.P S.3	M.P S.3	M.P S.3	M.P S.3	M.P S.3
	M.P S.3	M.P S.3	M.P S.3	M.P S.3						
12	N.F L	N.F L	N.F L	N.F L	N.F L	N.F L	N.F L	N.F L	N.F L	N.F L
	N.M R	N.M R.3								
13	N.M R.1	N.M R.1	N.M R.1	N.M R.1	N.M R.1	N.M R.1	N.M R.1	N.M R.1	N.M R.1	N.M R.1
	N.M R.1	N.M R.2								
14	N.F L	N.F L	N.F L	N.F L.2	N.F L.3	N.F L.3	N.F L.3	N.F L.3	N.F L.3	N.F L.3
	N.F L.3	N.F L.3	N.F L.3							
15	N.M R	N.M R.1	N.M R.1	N.M R.1	N.M R.1	N.M R.1	N.M R.1	N.M R.1	N.M R.1	N.M R.1
	N.M R.1	N.M R.7								
16	N.M R.2	N.M R.2	N.M R.2	N.M R.2	N.M R.2	N.M R.2	N.M R.2	N.M R.2	N.M R.2	N.M R.2
	N.M R.2	N.M R.2								
17										
18										
19	G.G S.1	G.G S.1	G.G S.1	G.G S.1	G.G S.1	G.G S.1	G.G S.1	G.G S.1	G.G S.1	G.G S.1
	G.G S.1	G.S R.1								
20	N.M R.3	N.M R.3	N.M R.7	N.M R.7	N.M R.7	N.M R.7	N.M R.7	N.M R.7	N.M R.7	N.M R.7
	N.M R.7	N.M R.7	N.M R.7							
21	M.U N.3	M.U N.3	M.U N.3	M.U N.3	M.U N.3	M.U N.3	M.U N.3	M.U N.3	M.U N.3	M.U N.3
	M.U N.3	M.U N.3								
22	G.G S	G.G S.1	G.G S.1	G.G S.1	G.G S.1	G.G S.1	G.G S.1	G.G S.1	G.G S.1	G.G S.1
	G.G S.2	G.S R.1								

Table 3.9
Objectives Coded to Each Item by Reviewers
Michigan Grade 3 Mathematics

23	G.GS.1	G.GS.1	G.GS.1	G.SR.1	G.SR.1	G.SR.1	G.SR.1	G.SR.1	G.SR.1	G.SR.1
	G.SR.1	G.SR.1								
24	N.FL	G.GS.3	G.GS.3	G.GS.3	G.GS.3	G.GS.3	G.GS.3	G.GS.3	G.GS.3	G.GS.3
	G.GS.3	G.GS.3	G.GS.3							
25	N.FL	G.GS.3	G.GS.3	G.GS.3	G.GS.3	G.GS.3	G.GS.3	G.GS.3	G.GS.3	G.GS.3
	G.GS.3	G.GS.3	G.GS.3							
26	M.UN.5	M.UN.5	M.UN.5	M.UN.5	M.UN.5	M.UN.5	M.UN.5	M.UN.5	M.UN.5	M.UN.5
	M.UN.5	M.UN.5								
27	N.ME.2	N.ME.2	N.ME.2	N.ME.2	N.ME.2	N.ME.2	N.ME.2	N.ME.2	N.ME.2	N.ME.2
	N.ME.2	N.ME.3								
28	N.ME.2	N.FL.4	N.FL.4	N.MR.4	N.MR.4	N.MR.4	N.MR.4	N.MR.4	N.MR.4	N.MR.5
	N.MR.5	N.MR.5	N.MR.5	N.MR.7						
29	M.UN.5	M.UN.5	M.UN.5	M.UN.5	M.UN.5	M.UN.5	M.UN.5	M.UN.5	M.UN.5	M.UN.5
	M.UN.5	M.UN.5								
30	N.ME.6	N.ME.6	N.ME.6	N.ME.6	N.ME.6	N.ME.6	N.ME.6	N.ME.6	N.ME.6	N.ME.6
	N.ME.6	N.ME.6								
31	G.GS.1	G.GS.1	G.GS.1	G.GS.1	G.GS.1	G.GS.1	G.GS.1	G.GS.1	G.GS.1	G.GS.1
	G.SR.1	G.SR.1								
32	N.ME.2	N.ME.3	N.ME.3	N.ME.3	N.ME.3	N.ME.3	N.ME.3	N.ME.3	N.ME.3	N.ME.3
	N.ME.3	N.ME.3								
33	N.MR.5	N.MR.5	N.MR.5	N.MR.5	N.MR.5	N.MR.5	N.MR.5	N.MR.5	N.MR.5	N.MR.5
	M.T	M.T	M.T							

Table 3.9
Objectives Coded to Each Item by Reviewers
Michigan Grade 3 Mathematics

	E.1	E.1	E.1							
34	M.UN.2	M.UN.3	M.UN.3	M.UN.3	M.UN.3	M.UN.3	M.UN.3	M.UN.3	M.UN.3	M.UN.3
	M.UN.3	M.UN.3								
35	G.GS.3	G.GS.3	G.GS.3	G.GS.3	G.GS.3	G.GS.3	G.GS.3	G.GS.3	G.GS.3	G.GS.3
	G.GS.3	G.GS.3								
36										
37										
38	N.ME	N.ME.4	N.ME.4	N.ME.5	N.ME.5	N.ME.5	N.ME.5	N.ME.5	N.ME.5	N.ME.5
	N.ME.5	N.ME.5								
39	N.ME	N.ME.3	N.ME.4	N.ME.4	N.ME.5	N.ME.5	N.ME.5	N.ME.5	N.ME.5	N.ME.5
	N.ME.5	N.ME.5								
40	N.ME.3	N.ME.4	N.ME.5	N.ME.5	N.ME.5	N.ME.5	N.ME.5	N.ME.5	N.ME.5	N.ME.5
	N.ME.5	N.ME.5								
41	M.UN.1	M.UN.1	M.UN.1	M.UN.1	M.UN.1	M.UN.1	M.UN.1	M.UN.1	M.UN.1	M.UN.1
	M.UN.1	M.UN.1								
42	N.MR	N.MR.4	N.MR.4	N.MR.4	N.MR.4	N.MR.5	N.MR.5	N.MR.5	N.MR.6	N.MR.6
	N.MR.7	N.MR.7	G.GS.3							
43	N.ME.2	N.ME.2	N.ME.2	N.ME.2	N.ME.2	N.ME.2	N.ME.2	N.ME.2	N.ME.2	N.ME.2
	N.ME.2	N.ME.2								
44	N.ME.1	N.ME.2	N.ME.2	N.ME.2	N.ME.2	N.ME.2	N.ME.2	N.ME.2	N.ME.2	N.ME.2
	N.ME.2	N.ME.2								
45	M.UN.5	M.UN.5	M.UN.5	M.UN.5	M.UN.5	M.UN.5	M.UN.5	M.UN.5	M.PS.2	M.PS.2
	M.PS.2	M.PS.2	M.PS.2	M.PS.2	M.PS.2					

Table 3.9
Objectives Coded to Each Item by Reviewers
Michigan Grade 3 Mathematics

46	G.GS.1	G.GS.1	G.GS.1	G.GS.1	G.GS.1	G.GS.1	G.GS.1	G.GS.1	G.SR.1	G.SR.1
	G.SR.1	G.SR.1								
47	N.FL	N.FL	N.FL	N.FL	N.FL	N.FL	N.FL	N.FL.1	N.FL.2	N.FL.2
	N.MR	N.MR.3								
48	M.UN.1	M.UN.1	M.UN.1	M.UN.1	M.UN.1	M.UN.1	M.UN.1	M.UN.1	M.UN.1	M.UN.1
	M.UN.1	M.UN.1								
49	G.GS.4	G.GS.4	G.GS.4	G.GS.4	G.GS.4	G.GS.4	G.GS.4	G.GS.4	G.GS.4	G.GS.4
	G.SR.1	G.SR.1								
50	N.ME.6	N.ME.6	N.ME.6	N.ME.6	M.UN	M.UN	M.UN	M.UN	M.UN.1	M.UN.1
	M.UN.1	M.UN.1	M.UN.1	M.PS.3						
51	N.ME.3	N.ME.3	N.ME.3	N.ME.3	N.ME.3	N.ME.3	N.ME.3	N.ME.3	N.ME.3	N.ME.3
	N.ME.3	N.ME.3								
52	N.MR.3	N.MR.3	N.MR.3	N.MR.3	M.PS	M.PS.2	M.PS.3	M.PS.3	M.PS.3	M.PS.3
	M.PS.3	M.PS.3	M.PS.3							
53	M.UN.3	M.UN.3	M.UN.3	M.UN.4	M.UN.4	M.UN.4	M.UN.4	M.UN.4	M.UN.4	M.UN.4
	M.UN.4	M.UN.4	M.PS							
54	N.ME.4	N.ME.4	N.ME.4	N.ME.4	N.ME.5	N.ME.5	N.ME.5	N.ME.5	N.ME.5	N.ME.5
	N.ME.5	N.ME.5	N.ME.6							
55	N.ME.5	N.ME.6	N.ME.6	N.ME.6	N.ME.6	N.ME.6	N.ME.6	N.ME.6	N.ME.6	N.ME.6
	N.ME.6	N.MR.1								
56	N.ME.4	N.ME.4	N.ME.4	N.ME.4	N.ME.5	N.ME.5	N.ME.5	N.ME.5	N.ME.5	N.ME.5
	N.M	N.M								

Table 3.9
Objectives Coded to Each Item by Reviewers
Michigan Grade 3 Mathematics

	E.5	E.5								
57	N.ME.3	N.ME.3	N.ME.3	N.ME.3	N.ME.3	N.ME.3	N.ME.3	N.ME.3	N.ME.3	N.ME.3
	N.ME.3	N.ME.3								
58	M.UN.3	M.UN.3	M.UN.3	M.UN.3	M.UN.3	M.UN.3	M.UN.3	M.UN.3	M.UN.3	M.UN.3
	M.UN.3	M.UN.3								
59										
60										
61	N.ME.3	M.UN	M.UN.3	M.UN.3	M.UN.3	M.UN.4	M.UN.4	M.UN.4	M.UN.4	M.UN.4
	M.UN.4	M.UN.4	M.UN.4	M.UN.4	M.UN.4					
62	M.UN.1	M.UN.1	M.UN.1	M.UN.1	M.UN.1	M.UN.1	M.UN.1	M.UN.1	M.UN.1	M.UN.1
	M.UN.1	M.UN.1								
63	M.UN	M.UN.3	M.UN.3	M.UN.4	M.UN.4	M.UN.4	M.UN.4	M.UN.4	M.UN.4	M.UN.4
	M.UN.4	M.UN.4	M.UN.4							
64	N.ME.4	N.ME.5	N.MR	N.MR	N.MR	N.MR.4	N.MR.5	N.MR.7	N.MR.7	N.MR.7
	N.MR.7	N.MR.7								
65	N.FL	N.FL	N.FL.2	N.MR.3	N.MR.3	M.PS.3	M.PS.3	M.PS.3	M.PS.3	M.PS.3
	M.PS.3	M.PS.3								
66	N.ME.4	N.ME.4	N.ME.4	N.ME.4	N.ME.4	N.ME.5	N.ME.5	N.ME.5	N.ME.5	N.ME.5
	N.ME.5	N.ME.5								
67	N.MR	N.MR.3	N.MR.4	N.MR.4	N.MR.4	N.MR.4	N.MR.4	N.MR.4	N.MR.7	N.MR.7
	N.MR.7	N.MR.7	N.MR.7							
68	G.GS.4	G.GS.4	G.GS.4	G.GS.4	G.GS.4	G.GS.4	G.GS.4	G.GS.4	G.GS.4	G.GS.4
	G.GS.4	G.SR.1								

Table 3.9
Objectives Coded to Each Item by Reviewers
Michigan Grade 3 Mathematics

69	G.G S.1	G.G S.1	G.S R.1	G.S R.1	G.T R.1	G.T R.1	G.T R.1	G.T R.1	G.T R.1	G.T R.1
	G.T R.1	G.T R.1								
70										
71										

Table 3.10
Items Coded by Reviewers to Each Objective
Michigan Grade 3 Mathematics

Low		Medium		High
0		14.54545		58

N																				
N.ME	38	39																		
N.ME.1	44																			
N.ME.2	4	27	27	27	27	27	27	27	27	27	27	27	28	32	43	43	43	43	43	43
	43	43	43	43	43	43	44	44	44	44	44	44	44	44	44	44	44			
N.ME.3	27	32	32	32	32	32	32	32	32	32	32	32	39	40	51	51	51	51	51	51
	51	51	51	51	51	51	57	57	57	57	57	57	57	57	57	57	57	57	61	
N.ME.4	38	38	39	39	40	54	54	54	54	56	56	56	56	64	66	66	66	66	66	
N.ME.5	38	38	38	38	38	38	38	38	38	39	39	39	39	39	39	39	39	40	40	40
	40	40	40	40	40	40	40	54	54	54	54	54	54	54	54	55	56	56	56	
	56	56	56	56	56	64	66	66	66	66	66	66	66							
N.ME.6	30	30	30	30	30	30	30	30	30	30	30	30	50	50	50	50	54	55	55	55
	55	55	55	55	55	55	55													
N.ME.7																				
N.ME.8																				
N.FL	4	5	5	5	5	5	5	5	5	5	5	5	8	12	12	12	12	12	12	12
	12	12	12	14	14	14	24	25	47	47	47	47	47	47	47	65	65			
N.FL.1	47																			
N.FL.2	1	1	1	1	1	1	2	3	3	5	9	9	14	47	47	65				
N.FL.3	3	4	4	4	4	4	4	4	4	4	4	4	8	8	8	8	8	8	8	8
	8	8	8	14	14	14	14	14	14	14	14	14								
N.FL.4	28	28																		
N.MR	12	15	42	47	64	64	64	67												

Table 3.10
Items Coded by Reviewers to Each Objective
Michigan Grade 3 Mathematics

N.MR.1	10	10	10	10	10	10	10	10	10	10	10	10	13	13	13	13	13	13	13	13
	13	13	13	15	15	15	15	15	15	15	15	15	15	55						
N.MR.2	6	7	13	16	16	16	16	16	16	16	16	16	16	16	16					
N.MR.3	1	1	2	3	3	3	3	6	7	9	11	12	20	20	47	52	52	52	52	65
	65	67																		
N.MR.4	3	28	28	28	28	28	28	42	42	42	42	64	67	67	67	67	67	67		
N.MR.5	28	28	28	28	33	33	33	33	33	33	33	33	33	33	42	42	42	64		
N.MR.6	3	42	42																	
N.MR.7	3	3	3	3	3	3	15	20	20	20	20	20	20	20	20	20	20	20	28	42
	42	64	64	64	64	64	67	67	67	67	67									
M																				
M.UN	50	50	50	50	61	63														
M.UN.1	41	41	41	41	41	41	41	41	41	41	41	41	48	48	48	48	48	48	48	48
	48	48	48	48	50	50	50	50	50	62	62	62	62	62	62	62	62	62	62	
	62	62																		
M.UN.2	34																			
M.UN.3	21	21	21	21	21	21	21	21	21	21	21	21	34	34	34	34	34	34	34	34
	34	34	34	53	53	53	58	58	58	58	58	58	58	58	58	58	58	58	61	
	61	61	63	63																
M.UN.4	53	53	53	53	53	53	53	53	53	61	61	61	61	61	61	61	61	61	61	63
	63	63	63	63	63	63	63	63	63											
M.UN.5	2	26	26	26	26	26	26	26	26	26	26	26	26	29	29	29	29	29	29	29
	29	29	29	29	29	45	45	45	45	45	45	45	45							
M.UN.6																				
M.TE																				
M.TE.1	33	33	33																	
M.P	52	53																		

Table 3.10
Items Coded by Reviewers to Each Objective
Michigan Grade 3 Mathematics

S																				
M.PS.1	1	1	6	6	6	6	6	7	7	7	7	7	9	9	9	9	9	9	11	11
	11	11																		
M.PS.2	2	2	2	2	2	2	6	45	45	45	45	45	45	45	52					
M.PS.3	1	1	1	1	1	2	2	2	2	2	2	2	2	2	4	4	6	6	6	6
	6	6	7	7	7	7	7	7	7	9	9	9	9	9	11	11	11	11	11	
	11	11	11	11	50	52	52	52	52	52	52	52	65	65	65	65	65	65	65	
G																				
G.GS	22																			
G.GS.1	19	19	19	19	19	19	19	19	19	19	19	22	22	22	22	22	22	22	22	22
	23	23	23	31	31	31	31	31	31	31	31	31	31	46	46	46	46	46	46	
	46	46	69	69																
G.GS.2	22																			
G.GS.3	24	24	24	24	24	24	24	24	24	24	24	24	25	25	25	25	25	25	25	25
	25	25	25	25	35	35	35	35	35	35	35	35	35	35	35	35	42			
G.GS.4	49	49	49	49	49	49	49	49	49	49	68	68	68	68	68	68	68	68	68	68
	68																			
G.SR																				
G.SR.1	19	22	23	23	23	23	23	23	23	23	23	31	31	46	46	46	46	49	49	68
	69	69																		
G.TR																				
G.TR.1	69	69	69	69	69	69	69	69												
G.LO																				
G.LO.1																				
D																				
D.RE																				
D.R																				

Table 3.10
Items Coded by Reviewers to Each Objective
Michigan Grade 3 Mathematics

E.1
D.R E.2
D.R E.3

Table 3.11
Number of Reviewers Coding an Item by Objective (Item Number: Number of Reviewers)
Michigan Grade 3 Mathematics

Low		Medium		High
1		6		12

N												
N.ME	38:1	39:1										
N.ME.1	44:1											
N.ME.2	4:1	27:11	28:1	32:1	43:12	44:11						
N.ME.3	27:1	32:11	39:1	40:1	51:12	57:12	61:1					
N.ME.4	38:2	39:2	40:1	54:4	56:4	64:1	66:5					
N.ME.5	38:9	39:8	40:10	54:8	55:1	56:8	64:1	66:7				
N.ME.6	30:12	50:4	54:1	55:10								
N.ME.7												
N.ME.8												
N.FL	4:1	5:11	8:1	12:10	14:3	24:1	25:1	47:7	65:2			
N.FL.1	47:1											
N.FL.2	1:6	2:1	3:2	5:1	9:2	14:1	47:2	65:1				
N.FL.3	3:1	4:11	8:11	14:9								
N.FL.4	28:2											
N.MR	12:1	15:1	42:1	47:1	64:3	67:1						
N.MR.1	10:12	13:11	15:10	55:1								
N.MR.2	6:1	7:1	13:1	16:12								
N.MR.3	1:2	2:1	3:4	6:1	7:1	9:1	11:1	12:1	20:2	47:1	52:4	65:2	67:1
N.MR.4	3:1	28:6	42:4	64:1	67:6							

Table 3.11
Number of Reviewers Coding an Item by Objective (Item Number: Number of Reviewers)
Michigan Grade 3 Mathematics

N.MR.5	28:4	33:10	42:3	64:1						
N.MR.6	3:1	42:2								
N.MR.7	3:6	15:1	20:11	28:1	42:2	64:5	67:5			
M										
M.UN	50:4	61:1	63:1							
M.UN.1	41:12	48:12	50:5	62:12						
M.UN.2	34:1									
M.UN.3	21:12	34:11	53:3	58:12	61:3	63:2				
M.UN.4	53:9	61:10	63:10							
M.UN.5	2:1	26:12	29:12	45:8						
M.UN.6										
M.TE										
M.TE.1	33:3									
M.PS	52:1	53:1								
M.PS.1	1:2	6:5	7:5	9:6	11:4					
M.PS.2	2:6	6:1	45:7	52:1						
M.PS.3	1:5	2:9	4:2	6:6	7:7	9:5	11:9	50:1	52:7	65:7
G										
G.GS	22:1									
G.GS.1	19:11	22:9	23:3	31:10	46:8	69:2				
G.GS.2	22:1									
G.GS.3	24:12	25:12	35:12	42:1						
G.G	49:1	68:1								

Table 3.11
Number of Reviewers Coding an Item by Objective (Item Number: Number of Reviewers)
Michigan Grade 3 Mathematics

S.4	0	1						
G.SR								
G.SR.1	19:1	22:1	23:9	31:2	46:4	49:2	68:1	69:2
G.TR								
G.TR.1	69:8							
G.LO								
G.LO.1								
D								
D.RE								
D.RE.1								
D.RE.2								
D.RE.3								

Table 3.13
Assessment Item DOK vs Consensus DOK (Item Number: Number of Reviewers [Average DOK])
Michigan Grade 3 Mathematics

Low DOK		Matched DOK		High DOK
1		6		12

N [2]:									
N.ME [2]:	38:1 [2]	39:1 [2]							
N.ME.1 [1]:	44:1 [1]								
N.ME.2 [2]:	4:1[2]	27:11[1.09]	28:1 [1]	32:1 [1]	43:12[1]	44:11[1]			
N.ME.3 [2]:	27:1 [1]	32:11[1.27]	39:1 [1]	40:1 [1]	51:12[1.75]	57:12[1.75]	61:1 [2]		
N.ME.4 [2]:	38:2 [1]	39:2 [1]	40:1 [1]	54:4 [1.25]	56:4 [1]	64:1 [1]	66:5 [1.6]		
N.ME.5 [1]:	38:9 [1.22]	39:8 [1.38]	40:10[1]	54:8 [1.25]	55:1 [2]	56:8 [1]	64:1 [1]	66:7 [1]	
N.ME.6 [1]:	30:12[1]	50:4 [1]	54:1 [1]	55:10[1]					
N.ME.7 [2]:									
N.ME.8 [1]:									
N.FL [2]:	4:1[2]	5:11 [1]	8:1[1]	12:10[1.8]	14:3 [1.67]	24:1 [2]	25:1 [2]	47:7 [1.71]	65:2 [2]
N.FL.1 [2]:	47:1 [2]								
N.FL.2 [1]:	1:6[1.17]	2:1[1]	3:2[1]	5:1[1]	9:2[1]	14:1 [2]	47:2 [1.5]	65:1 [2]	

Table 3.13
Assessment Item DOK vs Consensus DOK (Item Number: Number of Reviewers [Average DOK])
Michigan Grade 3 Mathematics

N.FL.3 [2]:	3:1[2]	4:11 [2]	8:11 [1.91]	14:9 [1.89]									
N.FL.4 [3]:	28:2 [2]												
N.MR [2]:	12:1 [1]	15:1 [1]	42:1 [1]	47:1 [1]	64:3 [1]	67:1 [2]							
N.MR.1 [1]:	10:12[1]	13:11[1.09]	15:10[1]	55:1 [2]									
N.MR.2 [2]:	6:1[1]	7:1[1]	13:1 [1]	16:12[1.5]									
N.MR.3 [3]:	1:2[1]	2:1[1]	3:4[1]	6:1[1]	7:1[1]	9:1[1]	11:1 [1]	12:1 [1]	20:2 [1]	47:1 [2]	52:4 [1.75]	65:2 [2]	67:1 [1]
N.MR.4 [1]:	3:1[1]	28:6 [1.17]	42:4 [1.25]	64:1 [1]	67:6 [1.5]								
N.MR.5 [2]:	28:4 [2]	33:10[1.6]	42:3 [1.67]	64:1 [1]									
N.MR.6 [2]:	3:1[1]	42:2 [1.5]											
N.MR.7 [2]:	3:6[1.17]	15:1 [1]	20:11[1]	28:1 [2]	42:2 [2]	64:5 [1.6]	67:5 [2]						
M [2]:													
M.UN [2]:	50:4 [1]	61:1 [2]	63:1 [2]										
M.UN.1 [1]:	41:12[1]	48:12[1]	50:5 [1]	62:12[1.25]									
M.UN.2 [2]:	34:1 [1]												
M.UN.3	21:12[1]	34:11[1.	53:3 [1.6	58:12[1.	61:3 [2]	63:2 [2]							

Table 3.13
Assessment Item DOK vs Consensus DOK (Item Number: Number of Reviewers [Average DOK])
Michigan Grade 3 Mathematics

[2]:		18]	7]	42]						
M.UN.4 [2]:	53:9 [1.33]	61:10[2.1]	63:10[2]							
M.UN.5 [1]:	2:1[1]	26:12[1.17]	29:12[1]	45:8 [1.25]						
M.UN.6 [1]:										
M.TE [2]:										
M.TE.1 [2]:	33:3 [1.67]									
M.PS [2]:	52:1 [2]	53:1 [2]								
M.PS.1 [1]:	1:2[1]	6:5[1]	7:5[1.2]	9:6[1.17]	11:4 [1.25]					
M.PS.2 [2]:	2:6[1.17]	6:1[2]	45:7 [1.71]	52:1 [1]						
M.PS.3 [2]:	1:5[1.4]	2:9[1.22]	4:2[2]	6:6[1.5]	7:7[1.29]	9:5[1]	11:9 [1]	50:1 [1]	52:7 [1.71]	65:7 [1.86]
G [2]:										
G.GS [2]:	22:1 [1]									
G.GS.1 [2]:	19:11[1]	22:9 [1.11]	23:3 [2]	31:10[1.4]	46:8 [1.62]	69:2 [1]				
G.GS.2 [3]:	22:1 [2]									
G.GS.3 [2]:	24:12[1.75]	25:12[1.75]	35:12[1.5]	42:1 [1]						
G.G	49:1	68:1								

Table 3.13
Assessment Item DOK vs Consensus DOK (Item Number: Number of Reviewers [Average DOK])
Michigan Grade 3 Mathematics

S.4 [1]:	0[1.1]	1[1]						
G.SR [3]:								
G.SR.1 [3]:	19:1 [1]	22:1 [1]	23:9 [1.78]	31:2 [1]	46:4 [1.75]	49:2 [2]	68:1 [1]	69:2 [1]
G.TR [1]:								
G.TR.1 [1]:	69:8 [1.38]							
G.LO [2]:								
G.LO.1 [2]:								
D [2]:								
D.RE [2]:								
D.RE.1 [2]:								
D.RE.2 [2]:								
D.RE.3 [2]:								

Table 3.13
Assessment Item DOK vs Consensus DOK (Item Number: Number of Reviewers [Average DOK])
Michigan Grade 3 Mathematics

Standards			Level by Objective			Hits		Cat. Concurr.
Title	Goals #	Objs #	Level	# of objs by Level	% w/in std by Level	Mean	S.D.	
N - Number & Operations	3	19.08	1 2	9 9	50 50	33.46	1.87	YES
M - Measurement	3	13.46	1 2	8 5	61 38	24.92	2.27	YES
G - Geometry	2	7.08	1 2 3	3 3 1	42 42 14	6.69	0.46	YES
D - Data & Probability	1	3.15	2	3	100	6.38	0.84	YES
Total	9	42.77	1 2 3	20 20 1	48 48 2	71.46	2.65	

Table 4.2
Depth-of-Knowledge Consistency Between Standards and Assessment as Rated by Thirteen Reviewers
Michigan Grade 4 Mathematics
Number of Assessment Items - 70

Standards			Hits		Level of Item w.r.t. Standard						DOK Consistency
					% Under		% At		% Above		
Title	Goals #	Objs #	M	S.D.	M	S.D.	M	S.D.	M	S.D.	
N - Number & Operations	3	19.08	33.46	1.87	16	36	58	42	26	36	YES
M - Measurement	3	13.46	24.92	2.27	11	25	57	39	31	38	YES
G - Geometry	2	7.08	6.69	0.46	48	45	45	43	7	21	YES
D - Data & Probability	1	3.15	6.38	0.84	12	30	81	35	7	21	YES
Total	9	42.77	71.46	2.65	18	35	58	41	24	36	

Table 4.3
Range-of-Knowledge Correspondence and Balance of Representation Between Standards and Assessment as Rated by Thirteen Reviewers
Michigan Grade 4 Mathematics
Number of Assessment Items - 70

Standards			Hits		Range of Objectives				Rng. of Know.	Balance Index				Bal. of Represent.
					# Objs Hit		% of Total			% Hits in Std/Ttl Hits		Index		
Title	Goals #	Objs #	Mean	S.D.	Mean	S.D.	Mean	S.D.		Mean	S.D.	Mean	S.D.	
N - Number & Operations	3	19.08	33.46	1.87	14.77	1.05	77	5	YES	47	3	0.77	0.05	YES
M - Measurement	3	13.46	24.92	2.27	8.54	1.15	63	7	YES	35	3	0.83	0.04	YES
G - Geometry	2	7.08	6.69	0.46	2.77	0.89	39	11	NO	9	1	0.85	0.08	YES
D - Data & Probability	1	3.15	6.38	0.84	2.31	0.61	73	15	YES	9	1	0.88	0.07	YES
Total	9	42.77	71.46	2.65	7.10	5.15	63	18		25	17	0.83	0.08	

Table 4.4
Summary of Attainment of Acceptable Alignment Level on Four Content Focus Criteria as Rated by Thirteen Reviewers
Michigan Grade 4 Mathematics
Number of Assessment Items - 70

Standards	Alignment Criteria			
	Categorical Concurrence	Depth-of-Knowledge Consistency	Range of Knowledge	Balance of Representation
N - Number & Operations	YES	YES	YES	YES
M - Measurement	YES	YES	YES	YES
G - Geometry	YES	YES	NO	YES
D - Data & Probability	YES	YES	YES	YES

Table 4.5
Source-of-Challenge Issues by Reviewer
Michigan Grade 4 Mathematics

Item Number	Comments by Reviewer
15	I think this problem could be clarified by saying that students have a choice of pizza or hamburgers. The wording now is a little ambiguous.
22	This picture is quite confusing and it is not clear that it is indeed a candy bar.
22	The fruit on this picture does not lend a student to believe that this is a candy bar.
22	The picture does not look like a candy bar with the fruit in the middle of it.
22	does not look like a candy bar
25	Placement of question and picture are confusing and the child may not understand what to answer.
25	What is the purpose of this problem? Seems trivial.
26	Who puts 4 quarters in a bank? How many 3rd graders have a bank account?
27	I am not sure why this question cannot be asked more directly. Possible confusion around the term 'most favored', though minimal, detracts from the basic mathematical skills this item is designed to measure.
27	I would reword the problem to state, how many students picked the most popular color.
27	The wording of this question is poor and grammatically incorrect. I would ask "Which color was the most popular?" or "How many students picked the most popular color?"
27	Wording is confusing: "the most favored color"
30	The foolproof way to answer the question is to pick the lowest temperature. That way the student can answer the question correctly but not know what the freezing point it.
30	This question is below a bar graph dealing with time spent outside with rather high numbers that could possible be associated with temperature. I would possible move this problem to another page or reword the question.
32	Some students may have different definition of what summer is. Is it when school is out? Is it when it get becomes a certain temperature outside?
32	First, there is an assumption that summer is the same all over the world, which it isn't. Second, it's an indirect question about how long it is between February and March.
35	This problem is confusing, because the use of two different graphs with different years is not necessary and makes you wonder which graph you need to put down for an answer.
35	Question is very confusing.
36	I think students might associate this question with the bar graph in the previous question and become confused. This problem should be on a different page or worded differently.
37	Asking students to make a 'reasonable prediction' is a vague criterion for a

Table 4.5
Source-of-Challenge Issues by Reviewer
Michigan Grade 4 Mathematics

	high-stakes assessment.
42	Perimeter of triangle is not mentioned as a GLCE
46	Why not word the question, "Which of these figures has no base?" The wording adds a level of complexity that does not relate to properties of 3D figures, but rather whether students understand "at least one".
48	This problem is awkwardly worded. Although it doesn't say so, I had to think that John had the dollar and was dividing it among his 3 friends. A student who understands that sharing means division would not be able to demonstrate this understanding if they understood the problem the way I initially did.
48	The right answer is not given and the question doesn't imply estimation
49	Not all students will know pepperoni. Students may get the wrong answer, but still understand about fractions.
50	MUN6 only uses square units. This uses a triangle unit.
52	Some students might not know the relative weight of bananas. Also, the amount of bananas bought would be subject to the amount of pudding being made.
62	Same comment as for item 49. Not all students will know pepperoni.
63	This is probably the closes GLCE, however, I'm not convinced that this question addresses this.
67	Too Complex
73	Equivalent fractions using objects other than strips is not stated as a GLCE
74	Problem is very confusing; N.MR.6 is closest GLCE.
79	The format of item 79 may be misleading. It looks like a multiple choice item by listing four choices A, B, C, and D. Some students may only circle one of the options rather than do all four.
79	This is a great problem, however students may assume that they are to only pick on of the steps in ABCD because they have been taking a test that has them choice one answer from ABCD.

Table 4.6
Depth-of-Knowledge Levels by Item and Reviewers
Intraclass Correlation
Michigan Grade 4 Mathematics

Item	Rater 1	Rater 2	Rater 3	Rater 4	Rater 5	Rater 6	Rater 7	Rater 8	Rater 9	Rater 10	Rater 11	Rater 12	Rater 13
1	1	1	1	1	1	1	1	1	1	1	1	1	1
2	1	1	1	1	1	1	1	1	1	1	1	1	1
3	1	1	1	1	1	1	1	1	1	1	1	1	1
4	1	1	1	1	1	1	1	1	2	1	2	1	2
5	1	1	1	1	1	1	1	1	1	1	1	1	1
6	1	1	1	1	1	1	1	1	1	1	1	1	1
7	2	1	1	2	1	2	2	2	1	1	2	2	2
8	1	1	1	1	1	1	1	1	1	1	1	1	1
9	2	1	1	2	2	2	2	1	2	2	1	2	2
10	2	2	2	1	2	2	2	2	2	2	3	2	2
11	2	1	1	2	2	2	2	2	2	2	2	2	2
12	2	1	2	2	2	2	2	2	2	2	2	2	3
13	2	1	2	2	2	2	2	2	2	2	2	2	2
14	1	1	1	2	1	1	1	1	1	1	1	1	1
15	2	2	2	2	2	2	2	2	2	2	2	2	2
16	1	1	1	2	1	2	2	2	2	1	2	2	2
17	2	1	2	2	2	2	2	2	2	2	2	2	2
18	2	1	2	2	2	2	2	2	2	2	2	1	2
19	1	1	1	1	1	1	1	1	1	1	1	1	1
20													
21													
22	1	1	1	1	1	1	1	1	1	1	1	1	2
23	1	1	1	1	1	1	1	1	2	1	1	1	1
24	1	1	1	1	1	1	1	1	1	1	1	2	1
25	1	1	1	2	2	1	1	1	1	1	2	2	1
26	1	1	1	1	1	1	1	1	1	1	1	1	1
27	2	1	1	2	2	1	2	2	2	2	2	2	2
28	1	2	1	2	1	1	1	1	2	1	2	1	2
29	2	1	1	2	2	1	2	2	2	2	2	2	2
30	1	1	1	2	1	1	1	1	1	1	1	2	1
31	1	2	1	1	1	2	1	2	1	2	2	2	1
32	2	1	1	2	2	1	1	1	2	2	2	2	2
33	1	1	1	1	2	1	2	2	2	2	2	2	2
34	1	1	2	1	1	2	1	1	2	2	2	1	2
35	2	2	2	2	2	2	2	2	2	2	2	2	2
36	1	1	1	1	1	1	1	1	1	2	1	1	2
37	2	2	2	2	2	2	2	2	2	2	2	3	3
38	1	2	2	2	2	2	2	2	2	2	2	2	2
39													
40													
41	1	1	2	1	1	2	2	2	1	2	1	2	2
42	1	1	1	1	2	1	2	2	2	1	2	2	2
43	1	1	1	1	1	1	1	1	1	1	1	1	1
44	1	2	2	2	2	2	2	2	3	1	2	2	3
45	1	1	2	2	1	1	1	1	2	2	2	1	2
46	1	1	2	2	1	2	1	2	2	2	2	2	2
47	2	2	2	2	2	2	2	2	3	2	2	3	3
48	1	2	2	2	2	2	2	2	2	2	2	2	2
49	1	1	2	1	1	1	2	1	1	1	1	2	2
50	2	2	2	2	2	2	2	2	2	2	3	3	2
51	1	2	1	2	2	1	1	1	2	2	2	1	2
52	1	2	2	2	2	2	1	1	2	1	1	3	2

Table 4.6
Depth-of-Knowledge Levels by Item and Reviewers
Intraclass Correlation
Michigan Grade 4 Mathematics

53	1	2	2	2	2	2	2	2	2	2	2	2	2
54	2	2	2	2	2	2	2	2	2	2	2	2	2
55	1	2	1	2	2	1	1	1	2	2	2	1	2
56	1	1	2	2	2	2	1	1	2	2	2	2	2
57	1	2	1	2	2	2	1	1	2	2	2	2	2
58	2	1	2	2	1	2	2	2	1	2	2	2	2
59													
60													
61	1	1	1	1	2	1	1	1	1	1	1	1	2
62	1	1	1	1	1	1	1	1	1	1	1	1	2
63	2	1	2	2	2	2	3	3	2	2	1	2	2
64	2	2	2	2	2	2	3	2	3	2	1	2	3
65	1	1	2	2	2	2	2	2	2	2	2	2	2
66	1	2	2	2	2	2	2	2	3	2	2	3	3
67	1	2	2	2	2	2	3	3	2	2	2	2	2
68	1	1	1	2	1	1	1	1	1	1	1	1	1
69	2	3	2	2	3	3	2	2	1	2	2	2	2
70	1	1	1	2	1	1	2	1	2	1	2	1	2
71	2	2	2	2	2	2	1	1	2	2	2	2	2
72	2	1	2	2	1	1	1	1	2	2	1	1	2
73	1	1	2	2	1	2	2	2	1	2	2	2	2
74	1	2	2	2	1	3	3	3	2	2	2	3	2
75	1	1	1	1	1	2	1	2	1	2	2	1	1
76													
77													
78													
79	3	3	2	3	3	3	3	3	4	3	2	3	4

Intraclass Correlation: 0.9349
Pairwise Comparison: 0.6784

Table 4.7
Notes by Reviewer
Michigan Grade 4 Mathematics

Item Number	Comments by Reviewer
6	Item 6 is written as if corresponding to NMR.1 division fact families. However, most students will just fill in the missing number in the one sentence without considering any other information.
8	refers to place value but N.ME.1 only refers to reading and writing numbers while N.ME.2 refers to expanded notation with place value, not by itself.
9	Item 9 also requires reading a table, but on expectation on that.
9	There should be a standard related to reading data tables. This is a skill kids need to know whether they are a part of a graph or not.
9	DRE?
9	See note for Item 8
10	unsure which number to relate quantity to
11	May also be N.MR.5 - but PS.3 seems to me to make students make a decision on what to do.
12	Item 12 does not test estimation. Many students will just subtract the two numbers.
12	MNR5
13	NMR5
13	MNR5?
14	The GLCE's limit comparing numbers up to 10,000. This problem involves numbers over 50,000.
15	NMR5
16	None of the standards explicitly addresses teh connection between pairs and division.
17	This item seems to be a close match to N.MR.5, however, it doesn't require the student to represent the problem objects or words.
17	There is not standard that fits this problem, though the problem is a good one.
18	This item seems to be a close match to N.MR.5, however, it doesn't require the student to represent the problem objects or words.
18	Great problem, but there is not a standard to match it.
25	There is no expectations that matches #25 because it asks to compare different halves.
25	Distractor with the fraction of half
27	DRE2
29	DRE2?
34	Where is problem solving in context?
35	Might have been D.RE.3 due to problem solving with comparisons.
36	this could also be M.UN.1
37	Although this is only 3rd grade, most basketball teams score many more than 8 or 10 points.
37	Prediction not mentioned in GLCEs listed
37	includes predicting

Table 4.7
Notes by Reviewer
Michigan Grade 4 Mathematics

42	The standard says perimeter of rectangles explicitly, but I think it could apply to triangles just as easily.
42	This was the closest match although the standard only refers to squares and rectangles.
42	The GLCE does not include calculating triangles.
42	Objective only refers to rectangles and squares not triangles.
42	The GLCE specifies knowing how to find the perimeter of a square and rectangle. This problem shows a triangle.
42	GLCE n.mr.5 does specify rect & square, should triangle be added?
44	includes conversion AND decision making for interpreting the prob/ and planning besides having to know how many cm in m.
46	"not" makes them think differently and having "at least" may confuse the problem more
47	Predictions not mentioned as an objective
47	predictions?
50	Could this also be geometry?
50	confusing question
52	item 52 asks students to estimate a weight of an object. There is no expectation on estimate of measurement.
52	No objective seems to refer directly to "choosing the correct unit of measure" for the choices given in this problem
56	Assigned MUN3 (understand relationships between sizes of standard units) for estimating the weight of an object. Not the best fit.
56	Multiple steps Estimation not addressed in objectives for weight
63	Too complex
64	Distractor in the responses
67	Distractors in the responses
69	Visualization needed
72	Item 72 is a pattern but not one with even and odd numbers. So it does not fit NME4 precisely. The grade epectation is the only one with patterns, however.
74	Needs picture-difficult to read.
74	N.ME.5 is close
79	mmr5?

Table 4.8

DOK Levels and Objectives Coded by Each Reviewer

Michigan Grade 4 Mathematics

Item	DOK0	PObj0	S1Obj0	DOK1	PObj1	S1Obj1	S2Obj1	DOK2	PObj2	DOK3	PObj3	S1Obj3	DOK4	PObj4	S1Obj4	DOK5	PObj5	S1Obj5	DOK6	PObj6	DOK7	PObj7	DOK8	PObj8	DOK9	PObj9	DOK10	PObj10	S1Obj10	DOK11	PObj11	DOK12	PObj12
1	1	M.PS.3		1	M.PS.3			1	M.PS.1	1	M.PS.3		1	M.PS.1		1	M.PS.3		1	M.PS.3	1	M.PS.1	1	N.MR.5	1	N.MR.5	1	N.FL.1		1	M.PS.1	1	N.MR.5
2	1	N.FL.3		1	N.MR.1			1	N.MR.1	1	N.MR.1		1	N.MR.1		1	N.MR.1		1	N.MR.1	1	N.MR.1	1	N.MR.1	1	N.MR.1	1	N.MR.1		1	N.MR.1	1	N.MR.1
3	1	N.ME.1		1	N.ME.1			1	N.ME.1	1	N.ME.1		1	N.ME.1		1	N.ME.1		1	N.ME.1	1	N.ME.1	1	N.ME.1	1	N.ME.1	1	N.ME.1		1	N.ME.1	1	N.ME.1
4	1	N.FL.1		1	N.FL.1			1	N.MR.5	1	N.FL.1		1	N.FL.1		1	N.MR.5		1	N.FL.1	1	N.FL.1	2	N.FL.1	1	N.MR.5	2	N.FL.1		1	N.FL.1	2	N.FL.1
5	1	N.FL.3		1	N.MR.1			1	N.MR.1	1	N.MR.1		1	N.MR.3		1	N.MR.1		1	N.MR.1	1	N.MR.1	1	N.MR.1	1	N.MR.1	1	N.MR.1		1	N.MR.1	1	N.MR.1
6	1	N.MR		1	N.MR.1			1	N.MR.1	1	N.MR.1		1	N.MR.3		1	N.MR.1		1	N.MR.1	1	N.MR.1	1	N.MR.1	1	N.MR.1	1	N.MR.1		1	N.MR.1	1	N.MR.1
7	2	N.FL.1		1	N.FL.1			1	N.MR.5	2	N.FL.1		1	N.FL.1		2	N.MR.5		2	N.MR.5	2	N.MR.5	1	N.FL.1	1	N.MR.5	2	N.FL.1		2	N.FL	2	N.FL.1
8	1	N.ME.2		1	N.ME.2			1	N.ME.2	1	N.ME.2		1	N.ME.2		1	N.ME.2		1	N.ME.2	1	N.ME.2	1	N.ME	1	N.ME.2	1	N.ME.2		1	N.ME.2	1	N.ME.2
9	2	N.ME.2		1	N.ME.2			1	N.ME.2	2	N.ME.2		2	N.ME.2	D	2	N.ME.2		2	N.ME.2	1	N.ME.2	2	N.ME	2	N.ME	1	N.ME.2		2	N.ME.2	2	N.ME.2
10	2	N.ME.3	N.ME.1	2	N.ME.1			2	N.ME.3	1	N.ME.3	N.ME.2	2	N.ME.1		2	N.ME		2	N.ME	2	N.ME	2	N.ME	2	N.ME.1	3	N.ME.3	N.ME.1	2	N.ME.3	2	N.ME
11	2	N.FL.1		1	N.FL.1			1	N.MR.5	2	N.FL.1		2	N.MR.5		2	N.MR.5		2	N.MR.5	2	N.MR.5	2	M.PS.3	2	N.MR.5	2	N.FL.1		2	N.FL.1	2	N.FL.1
12	2	N.FL.2		1	N.FL.2			2	N.MR.5	2	N.FL.2		2	N.FL.2		2	N.FL.2	N.MR.5	2	N.FL.2	2	N.FL.2	2	N.FL.2	2	N.FL.2	2	N.FL.2		2	N.FL.2	3	N.FL.2
13	2	N.FL.2		1	N.FL.2			2	N.MR.5	2	N.FL.2		2	N.FL.2		2	N.FL.2		2	N.FL.2	2	N.FL.2	2	N.FL.2	2	N.FL.2	2	N.FL.2		2	N.FL.2	2	N.FL.2
14	1	N.ME.3		1	N.ME.3			1	N.ME.3	2	N.ME.3		1	N.ME.3		1	N.ME.3		1	N.ME.3	1	N.ME.3	1	N.ME.3	1	N.ME.3	1	N.ME.3		1	N.ME.3	1	N.ME.3
15	2	N.FL.2		2	N.FL.2			2	N.MR.5	2	N.FL.2		2	N.FL.2		2	N.FL.2		2	N.FL.2	2	N.FL.2	2	N.FL.2	2	N.FL.2	2	N.FL.2		2	N.FL.2	2	N.FL.2
16	1	N.FL.3		1	N.ME.4			1	N.MR	2	N.MR.2		1	N.MR.2		2	N.MR.2		2	N.MR.2	2	N.MR.2	2	N.MR.2	1	N.MR.2	2	N.MR.2		2	N.MR.2	2	N.MR.2
17	2	N.FL.1		1	N.MR.5			2	N.FL.1	2	N.MR.5		2	N.MR.5		2	N.MR.5		2	N.MR.5	2	N.MR.5	2	N.MR.5	2	N.MR.5	2	N.MR.5		2	N.FL.3	2	N.MR.5
18	2	N.MR.5		1	N.MR.6			2	N.FL.1	2	N.MR.5		2	N.MR.5		2	N.MR.5		2	N.MR.5	2	N.MR.5	2	N.MR.5	2	N.MR.5	2	N.MR.5		1	N.MR.5	2	N.MR.5
19	1	N.ME.1		1	N.ME.1			1	N.ME.1	1	N.ME.2		1	N.ME.3		1	N.ME.2		1	N.ME.2	1	N.ME.2	1	N.ME.2	1	N.ME.2	1	N.ME.1		1	N.ME.1	1	N.ME.2
20																																	
21																																	
22	1	M.UN.2		1	M.UN.1			1	M.UN.1	1	M.UN.1		1	M.UN.1		1	M.UN.1		1	M.UN.1	1	M.UN.1	1	M.UN.1	1	M.UN.2	1	M.UN.1		1	M.UN.1	2	M.UN.1

Table 4.8
DOK Levels and Objectives Coded by Each Reviewer
Michigan Grade 4 Mathematics

23	1	M.UN.1		1	M.UN.1			1	M.UN.2	1	M.UN.2		1	M.UN.1		1	M.UN.1		1	M.UN.1	1	M.UN.1	2	M.UN.1	1	M.UN.1	1	M.UN.1		1	M.UN.2	1	M.UN.1
24	1	N.ME.9		1	N.ME.9	M.PS.3		1	M.PS.3	1	N.ME.9		1	N.ME.9		1	N.ME.9		1	N.ME.9	1	N.ME.9	1	N.ME.9	1	N.ME.9	1	N.ME.9		2	M.UN.2	1	N.ME.9
25	1	N.ME		1	N.ME.6			1	M.PS.3	2	N.ME.5		2	N.ME.5		1	M.UN.7		1	M.UN.7	1	M.UN.7	1	N.ME.6	1	N.ME.5	2	N.ME.5		2	N.ME.5	1	N.ME.5
26	1	M.PS.2		1	N.ME.9	M.PS.3		1	M.PS.3	1	N.ME.9		1	N.ME.9		1	M.PS.2		1	M.PS.2	1	N.ME.9	1	N.ME.9	1	N.ME.9	1	N.ME.9		1	M.UN.2	1	N.ME.9
27	2	D.RE.2		1	D.RE.1	D.RE.2		1	D.RE.2	2	D.RE.2		2	D.RE.2		1	D.RE.2		2	D.RE.1	2	D.RE.2	2	D.RE.2	2	D.RE.2	2	D.RE.2		2	D.RE.2	2	D.RE.2
28	1	M.PS.2		2	M.PS.3	M.PS.2		1	M.PS.3	2	M.PS.2		1	M.PS.3		1	M.PS.2		1	M.PS.2	1	M.PS.2	2	M.PS.2	1	M.PS.2	2	M.PS.2		1	M.PS.3	2	M.PS.3
29	2	D.RE.2		1	D.RE.1	D.RE.2		1	D.RE.2	2	D.RE.2		2	D.RE.1		1	D.RE.2		2	D.RE.1	2	D.RE.2	2	D.RE.2	2	D.RE.2	2	D.RE.2		2	D.RE.2	2	D.RE.2
30	1	M.UN.4		1	M.UN.4			1	M.UN.4	2	M.UN.4		1	M.UN.4		1	M.UN.4		1	M.UN.4	1	M.UN.4	1	M.UN.4	1	M.UN.4	1	M.UN.4		2	M.UN.4	1	M.UN.4
31	1	G.GS.4		2	G.GS.1			1	G.SR.1	1	G.SR.1		1	G.SR.1		2	G.GS.4		1	G.GS.1	2	G.GS.4	1	G.SR.1	2	G.SR.1	2	G.SR.1		2	G.GS.4	1	G.SR.1
32	2	D.RE.2		1	M.UN.1	M.UN.2		1	M.PS.3	2	M.UN.2		2	M.UN.2		1	M.UN.1		1	M.UN.1	1	M.UN.1	2	M.UN.1	2	M.PS.3	2	M.UN.3		2	M.UN.1	2	M.UN.1
33	1	M.UN.3		1	D.RE.1	D.RE.2		1	D.RE.2	1	D.RE.2		2	D.RE.3		1	D.RE.2		2	D.RE.1	2	D.RE.2	2	D.RE.2	2	D.RE.2	2	D.RE.2		2	D.RE.3	2	D.RE.2
34	1	M.PS.3		1	M.PS.2	M.PS.3		2	M.PS.3	1	M.PS.2		1	M.PS.2		2	M.PS.3		1	M.PS.2	1	M.PS.2	2	M.PS.2	2	M.PS.2	2	M.PS.2		1	M.PS.2	2	M.PS.2
35	2	D.RE.3		2	D.RE.3			2	D.RE.2	2	D.RE.3	D.RE.2	2	D.RE.2		2	D.RE.2		2	D.RE.2	2	D.RE.2	2	D.RE.2	2	D.RE.3	2	D.RE.2		2	D.RE.3	2	D.RE.2
36	1	M.UN.3		1	M.UN.3			1	M.UN.1	1	M.UN.3		1	M.UN.3		1	M.UN.2		1	M.UN.3	1	M.UN.2	1	M.UN.1	2	M.UN.3	1	M.UN.2		1	M.UN.1	2	M.UN.2
37	2	D.RE.3		2	D.RE.3			2	D.RE.3	2	D.RE.3		2	D.RE.3		2	D.RE.3		2	D.RE.3	2	D.RE.3	2	D.RE	2	D.RE.3	2	D.RE.3		3	D.RE.3	3	D.RE.3
38	1	N.MR.2		2	N.MR.2			2	N.MR.5	2	N.MR.2		2	N.MR.5		2	N.MR.5		2	N.MR.5	2	N.MR.5	2	N.MR.2	2	N.MR.2	2	N.MR.2		2	N.MR.2	2	N.MR.2
39																																	
40																																	
41	1	G.GS.4		1	G.GS.5			2	G.GS.4	1	G.GS.5		1	G.GS.5		2	G.GS.4		2	G.GS.4	2	G.GS.4	1	G.GS.5	2	G.GS.5	1	G.GS.5		2	G.GS.5	2	G.GS.5
42	1	M.UN.5		1	M.UN.5			1	M.UN.5	1	M.UN.5		2	M.UN.5		1	M.UN		2	M.UN	2	M.UN	2	M.UN.5	1	M.UN.5	2	M.UN.5		2	M.UN	2	N.MR.5
43	1	G.GS.4		1	G.GS.5			1	G.GS.5	1	G.GS.5		1	G.GS.5		1	G.GS.5		1	G.GS.4	1	G.GS.2	1	G.GS.5	1	G.GS.5	1	G.GS.5		1	G.GS.5	1	G.GS.5
44	1	N.FL.1	M.UN.2	2	M.UN.2			2	M.PS.1	2	M.UN.2		2	M.UN.2		2	M.PS.1		2	M.PS.1	2	M.PS.1	3	M.PS.1	1	M.PS.1	2	M.PS.1		2	M.PS.1	3	M.PS.1
45	1	M.PS.2		1	M.PS.3			2	M.PS.2	2	M.PS.2		1	M.PS.2		1	M.PS.2		1	M.PS.2	1	M.PS.2	2	M.PS.2	2	M.PS.2	2	M.PS.2		1	M.PS.2	2	M.PS.2
46	1	G.GS.4		1	G.GS.5			2	G.GS.5	2	G.GS.5		1	G.GS.5		2	G.GS.5		1	G.SR	2	G.GS.5	2	G.GS.5	2	G.GS.5	2	G.GS.5		2	G.GS.5	2	G.GS.5

Table 4.8
DOK Levels and Objectives Coded by Each Reviewer
Michigan Grade 4 Mathematics

47	2	D.RE.3		2	D.RE.3			2	D.RE.3	2	D.RE.3		2	D.RE.3		2	D.RE.3		2	D.RE.3	2	D.RE.3	3	D.RE	2	D.RE.3	2	D.RE.3		3	D.RE.3	3	D.RE.3
48	1	M.PS.3		2	M.PS.3			2	M.PS.3	2	M.PS.3		2	M.PS.3		2	N.MR.4		2	N.MR.4	2	N.MR.4	2	M.PS.3	2	M.PS.3	2	M.PS.3		2	M.PS.3	2	M.PS.3
49	1	N.ME.5		1	N.ME.5			2	N.ME.5	1	N.ME.5		1	N.ME.5		1	N.ME.5		2	N.ME.5	1	N.ME.5	1	N.ME.5	1	N.ME.5	1	N.ME.5		2	N.ME.8	2	N.ME.5
50	2	M.UN		2	G.SR.1			2	G.SR.1	2	G.SR.1		2	G.SR.1		2	M.UN		2	M.UN	2	M.UN	2	G.SR.1	2	G.SR.1	3	G.SR.1		3	G.SR.1	2	G.SR.1
51	1	M.UN.5		2	M.UN.5			1	M.UN.5	2	M.PS.4		2	M.PS.4		1	M.UN.5		1	M.UN.5	1	M.UN.5	2	M.UN.5	2	M.UN.5	2	M.UN.5		1	M.UN.5	2	M.UN.5
52	1	M.UN		2	M.UN.3			2	M.UN.3	2	M.UN.3		2	M.UN.3		2	M.UN.3		1	M.UN.3	1	M.UN.3	2	M.UN	1	M.UN.3	1	M.UN.3		3	M.UN.3	2	M.UN.1
53	1	N.MR.2		2	N.MR.2			2	N.MR.5	2	N.MR.2		2	N.MR.2		2	N.MR.2		2	N.MR.2	2	N.MR.2	2	N.MR.2	2	N.MR.2	2	N.MR.2		2	N.MR.5	2	N.MR.2
54	2	N.FL.1	M.UN.2	2	M.UN.2			2	M.PS.1	2	M.UN.2		2	M.UN.2		2	M.PS.1		2	M.PS.1	2	M.PS.1	2	M.PS.1	2	M.PS.1	2	M.PS.1		2	M.UN.2	2	M.PS.3
55	1	M.UN.5		2	M.UN.5			1	M.UN.5	2	M.PS.4		2	M.PS.4		1	M.UN.5		1	M.UN.5	1	M.UN.5	2	M.UN.5	2	M.UN.5	2	M.UN.5		1	M.UN.5	2	M.UN.5
56	1	M.UN.3		1	M.UN.3			2	M.UN.3	2	M.UN.3		2	M.UN.3		2	M.UN.3		1	M.UN.1	1	M.UN.3	2	M.UN	2	M.UN.2	2	M.UN.3		2	M.UN.3	2	M.UN.1
57	1	M.UN.5		2	M.PS.4			1	M.UN.5	2	M.PS.4		2	M.PS.4		2	M.UN.5		1	M.UN.5	1	M.UN.5	2	M.UN.5	2	M.UN.5	2	M.UN.5		2	M.TE.1	2	M.UN.5
58	2	M.UN.2		1	M.PS.4			2	M.UN.2	2	M.UN.2		1	M.UN.2		2	M.PS.1		2	M.PS.1	2	M.PS.1	1	M.PS.3	2	M.PS.3	2	M.PS.1		2	M.UN.2	2	M.PS.3
59																																		
60																																		
61	1	N.ME.3		1	N.ME.3			1	N.ME.3	1	N.ME.3		2	N.ME.3		1	N.ME.3		1	N.ME.3	1	N.ME.3	1	N.ME.1	1	N.ME.3	1	N.ME.3		1	N.ME.3	2	N.ME.3
62	1	N.ME.5		1	N.ME.5			1	N.ME.5	1	N.ME.5		1	N.ME.5		1	N.ME.5		1	N.ME.5	1	N.ME.5	1	N.ME.5	1	N.ME.5	1	N.ME.5		1	N.ME.8	2	N.ME.5
63	2	N.ME.5		1	N.ME.5			2	N.ME	2	N.ME.6		2	N.ME.8		2	N.ME.5		3	N.ME.5	3	N.ME.5	2	N.ME.5	2	N.ME.5	1	N.ME.5		2	N.ME.5	2	N.ME.5
64	2	M.UN.2		2	M.UN.2			2	M.UN.2	2	M.UN.2		2	M.UN.2		2	M.PS.1		3	M.PS.1	2	M.PS.1	3	M.PS.3	2	M.UN.2	1	M.UN.2		2	M.UN.3	3	M.PS.3
65	1	G.GS.5		1	G.GS.5			2	G.GS.4	2	G.GS.5		2	G.GS.5		2	G.GS.5		2	G.GS.5	2	G.GS.5	2	G.GS.5	2	G.GS.5	2	G.GS.5		2	G.GS.5	2	G.GS.5
66	1	N.MR.2		2	N.MR.5			2	N.MR.5	2	N.MR.5		2	N.MR.5		2	N.MR.5		2	N.MR.5	2	N.MR.5	3	N.MR.2	2	N.MR.2	2	N.MR.2		3	M.PS.4	3	N.MR.2
67	1	M.UN.2		2	M.UN.1			2	M.UN.2	2	M.UN.2		2	M.UN.2		2	M.PS.1		3	M.PS.1	3	M.PS.1	2	M.PS.3	2	M.UN.2	2	M.UN.2		2	M.UN.2	2	M.PS.3
68	1	M.UN.4		1	M.UN.4			1	M.UN.4	2	M.UN.4		1	M.UN.4		1	M.UN.4		1	M.UN.4	1	M.UN.4	1	M.UN.4	1	M.UN.4	1	M.UN.4		1	M.UN.4	1	M.UN.4
69	2	G.SR.1		3	G.SR.1			2	G.SR.1	2	G.SR.1		3	G.SR.1		3	G.GS.5		2	G.SR.1	2	G.SR.1	1	G.SR.1	2	G.GS.4	2	G.SR.1		2	G.SR.1	2	G.SR.1
70	1	M.UN.4		1	M.UN.4			1	M.UN.4	2	M.UN.4		1	M.UN.4		1	M.UN.4		2	M.UN.4	1	M.UN.4	2	M.UN.4	1	M.UN.4	2	M.UN.4		1	M.UN.4	2	M.UN.4

Table 4.8
DOK Levels and Objectives Coded by Each Reviewer
Michigan Grade 4 Mathematics

71	2	N.M E.3		2	N.M E.3			2	N.M E.3	2	N.M E.3		2	N.M E.3		2	N.M E.3		1	N.M E.3	1	N.M E.3	2	N.M E.3	2	N.M E.3	2	N.M E.3		2	M.P S.3	2	N.M E.3
72	2	N.M E.4		1	N.M R			2	N.M E.4	2	N.M E.4		1	N.M E.4		1	N.M E.4		1	N.M E.4	1	N.M E.4	2	N.M E.4	2	N.M E.4	1	N.M E.4		1	N.M E.4	2	N.M E.4
73	1	N.M E.6		1	N.M E.6			2	N.M E.6	2	N.M E.6		1	N.M E.6		2	N.M E.6		2	N.M E.6	2	N.M E.6	1	N.M E.6	2	N.M E.6	2	N.M E.6		2	N.M E	2	N.M E.7
74	1	N.M E.8		2	N.M E.8			2	N.M E.8	2	N.M E.8		1	N.M E.8		3	N.M E.8		3	N.M E.8	3	N.M E.8	2	N.M E.8	2	N.M E.8	2	N.M E.8		3	N.M R	2	N.M E.8
75	1	N.M R.3		1	N.M R			1	N.M R.3	1	N.M E.4		1	N.M R.3		2	N.M R.3		1	N.M R.3	2	N.M R.3	1	N.M R.3	2	N.M R.3	2	N.M R.3		1	N.M R.3	1	N.M R.3
76																																	
77																																	
78																																	
79	3	M.P S.2		3	N.M E.1	M.P S.2	N.M R.5	2	N.M R.5	3	M.P S.3		3	M.P S.3		3	M.P S.3	M.P S.2	3	M.P S.3	3	M.P S.3	4	N.M R.5	3	N.M R.5	2	M.P S.3		3	M.P S.3	4	N.M R.5

Pairwise Comparison: 0.6238
Standard Pairwise Comparison: 0.939

Table 4.9
Objectives Coded to Each Item by Reviewers
Michigan Grade 4 Mathematics

Low		Medium		High
0		11.75949		16

1	N.F L.1	N.M R.5	N.M R.5	N.M R.5	M.P S.1	M.P S.1	M.P S.1	M.P S.1	M.P S.3	M.P S.3
	M.P S.3	M.P S.3	M.P S.3							
2	N.F L.3	N.M R.1	N.M R.1	N.M R.1	N.M R.1	N.M R.1	N.M R.1	N.M R.1	N.M R.1	N.M R.1
	N.M R.1	N.M R.1	N.M R.1							
3	N.M E.1	N.M E.1	N.M E.1	N.M E.1	N.M E.1	N.M E.1	N.M E.1	N.M E.1	N.M E.1	N.M E.1
	N.M E.1	N.M E.1	N.M E.1							
4	N.F L.1	N.F L.1	N.F L.1	N.F L.1	N.F L.1	N.F L.1	N.F L.1	N.F L.1	N.F L.1	N.F L.1
	N.M R.5	N.M R.5	N.M R.5							
5	N.F L.3	N.M R.1	N.M R.1	N.M R.1	N.M R.1	N.M R.1	N.M R.1	N.M R.1	N.M R.1	N.M R.1
	N.M R.1	N.M R.1	N.M R.3							
6	N.M R	N.M R.1	N.M R.1	N.M R.1	N.M R.1	N.M R.1	N.M R.1	N.M R.1	N.M R.1	N.M R.1
	N.M R.1	N.M R.1	N.M R.3							
7	N.F L	N.F L.1	N.F L.1	N.F L.1	N.F L.1	N.F L.1	N.F L.1	N.F L.1	N.M R.5	N.M R.5
	N.M R.5	N.M R.5	N.M R.5							
8	N.M E	N.M E.2	N.M E.2	N.M E.2	N.M E.2	N.M E.2	N.M E.2	N.M E.2	N.M E.2	N.M E.2
	N.M E.2	N.M E.2	N.M E.2							
9	N.M E	N.M E	N.M E.2	N.M E.2	N.M E.2	N.M E.2	N.M E.2	N.M E.2	N.M E.2	N.M E.2
	N.M E.2	N.M E.2	N.M E.2	D						
10	N.M E	N.M E	N.M E	N.M E	N.M E	N.M E.1	N.M E.1	N.M E.1	N.M E.1	N.M E.1
	N.M	N.M	N.M	N.M	N.M	N.M				

Table 4.9
Objectives Coded to Each Item by Reviewers
Michigan Grade 4 Mathematics

	E.2	E.3	E.3	E.3	E.3	E.3				
11	N.F L.1	N.F L.1	N.F L.1	N.F L.1	N.F L.1	N.F L.1	N.M R.5	N.M R.5	N.M R.5	N.M R.5
	N.M R.5	N.M R.5	M.P S.3							
12	N.F L.2	N.F L.2	N.F L.2	N.F L.2	N.F L.2	N.F L.2	N.F L.2	N.F L.2	N.F L.2	N.F L.2
	N.F L.2	N.F L.2	N.M R.5	N.M R.5						
13	N.F L.2	N.F L.2	N.F L.2	N.F L.2	N.F L.2	N.F L.2	N.F L.2	N.F L.2	N.F L.2	N.F L.2
	N.F L.2	N.F L.2	N.M R.5							
14	N.M E.3	N.M E.3	N.M E.3	N.M E.3	N.M E.3	N.M E.3	N.M E.3	N.M E.3	N.M E.3	N.M E.3
	N.M E.3	N.M E.3	N.M E.3							
15	N.F L.2	N.F L.2	N.F L.2	N.F L.2	N.F L.2	N.F L.2	N.F L.2	N.F L.2	N.F L.2	N.F L.2
	N.F L.2	N.F L.2	N.M R.5							
16	N.M E.4	N.F L.3	N.M R	N.M R.2	N.M R.2	N.M R.2	N.M R.2	N.M R.2	N.M R.2	N.M R.2
	N.M R.2	N.M R.2	N.M R.2							
17	N.F L.1	N.F L.1	N.F L.3	N.M R.5	N.M R.5	N.M R.5	N.M R.5	N.M R.5	N.M R.5	N.M R.5
	N.M R.5	N.M R.5	N.M R.5							
18	N.F L.1	N.M R.5	N.M R.5	N.M R.5	N.M R.5	N.M R.5	N.M R.5	N.M R.5	N.M R.5	N.M R.5
	N.M R.5	N.M R.5	N.M R.6							
19	N.M E.1	N.M E.1	N.M E.1	N.M E.1	N.M E.1	N.M E.2	N.M E.2	N.M E.2	N.M E.2	N.M E.2
	N.M E.2	N.M E.2	N.M E.3							
20										
21										
22	M.U N.1	M.U N.1	M.U N.1	M.U N.1	M.U N.1	M.U N.1	M.U N.1	M.U N.1	M.U N.1	M.U N.1
	M.U N.1	M.U N.2	M.U N.2							

Table 4.9
Objectives Coded to Each Item by Reviewers
Michigan Grade 4 Mathematics

23	M.UN.1	M.UN.1	M.UN.1	M.UN.1	M.UN.1	M.UN.1	M.UN.1	M.UN.1	M.UN.1	M.UN.1
	M.UN.2	M.UN.2	M.UN.2							
24	N.ME.9	N.ME.9	N.ME.9	N.ME.9	N.ME.9	N.ME.9	N.ME.9	N.ME.9	N.ME.9	N.ME.9
	N.ME.9	M.UN.2	M.PS.3	M.PS.3						
25	N.ME	N.ME.5	N.ME.5	N.ME.5	N.ME.5	N.ME.5	N.ME.5	N.ME.6	N.ME.6	M.UN.7
	M.UN.7	M.UN.7	M.PS.3							
26	N.ME.9	N.ME.9	N.ME.9	N.ME.9	N.ME.9	N.ME.9	N.ME.9	N.ME.9	M.UN.2	M.PS.2
	M.PS.2	M.PS.2	M.PS.3	M.PS.3						
27	D.RE.1	D.RE.1	D.RE.2	D.RE.2	D.RE.2	D.RE.2	D.RE.2	D.RE.2	D.RE.2	D.RE.2
	D.RE.2	D.RE.2	D.RE.2	D.RE.2						
28	M.PS.2	M.PS.2	M.PS.2	M.PS.2	M.PS.2	M.PS.2	M.PS.2	M.PS.2	M.PS.2	M.PS.3
	M.PS.3	M.PS.3	M.PS.3	M.PS.3						
29	D.RE.1	D.RE.1	D.RE.1	D.RE.2	D.RE.2	D.RE.2	D.RE.2	D.RE.2	D.RE.2	D.RE.2
	D.RE.2	D.RE.2	D.RE.2	D.RE.2						
30	M.UN.4	M.UN.4	M.UN.4	M.UN.4	M.UN.4	M.UN.4	M.UN.4	M.UN.4	M.UN.4	M.UN.4
	M.UN.4	M.UN.4	M.UN.4							
31	G.GS.1	G.GS.1	G.GS.4	G.GS.4	G.GS.4	G.GS.4	G.SR.1	G.SR.1	G.SR.1	G.SR.1
	G.SR.1	G.SR.1	G.SR.1							
32	M.UN.1	M.UN.1	M.UN.1	M.UN.1	M.UN.1	M.UN.1	M.UN.1	M.UN.2	M.UN.2	M.UN.2
	M.UN.3	M.PS.3	M.PS.3	D.RE.2						
33	M.UN.3	D.RE.1	D.RE.1	D.RE.2	D.RE.2	D.RE.2	D.RE.2	D.RE.2	D.RE.2	D.RE.2
	D.R	D.R	D.R	D.R						

Table 4.9
Objectives Coded to Each Item by Reviewers
Michigan Grade 4 Mathematics

	E.2	E.2	E.3	E.3						
34	M.P S.2	M.P S.2	M.P S.2	M.P S.2	M.P S.2	M.P S.2	M.P S.2	M.P S.2	M.P S.2	M.P S.2
	M.P S.3	M.P S.3	M.P S.3	M.P S.3						
35	D.R E.2	D.R E.2	D.R E.2	D.R E.2	D.R E.2	D.R E.2	D.R E.2	D.R E.2	D.R E.2	D.R E.3
	D.R E.3	D.R E.3	D.R E.3	D.R E.3						
36	M.U N.1	M.U N.1	M.U N.1	M.U N.2	M.U N.2	M.U N.2	M.U N.2	M.U N.3	M.U N.3	M.U N.3
	M.U N.3	M.U N.3	M.U N.3							
37	D.R E	D.R E.3	D.R E.3	D.R E.3	D.R E.3	D.R E.3	D.R E.3	D.R E.3	D.R E.3	D.R E.3
	D.R E.3	D.R E.3	D.R E.3							
38	N.M R.2	N.M R.2	N.M R.2	N.M R.2	N.M R.2	N.M R.2	N.M R.2	N.M R.2	N.M R.5	N.M R.5
	N.M R.5	N.M R.5	N.M R.5							
39										
40										
41	G.G S.4	G.G S.4	G.G S.4	G.G S.4	G.G S.4	G.G S.5	G.G S.5	G.G S.5	G.G S.5	G.G S.5
	G.G S.5	G.G S.5	G.G S.5							
42	N.M R.5	M.U N	M.U N	M.U N	M.U N	M.U N.5	M.U N.5	M.U N.5	M.U N.5	M.U N.5
	M.U N.5	M.U N.5	M.U N.5							
43	G.G S.2	G.G S.4	G.G S.4	G.G S.5	G.G S.5	G.G S.5	G.G S.5	G.G S.5	G.G S.5	G.G S.5
	G.G S.5	G.G S.5	G.G S.5							
44	N.F L.1	M.U N.2	M.U N.2	M.U N.2	M.U N.2	M.P S.1	M.P S.1	M.P S.1	M.P S.1	M.P S.1
	M.P S.1	M.P S.1	M.P S.1	M.P S.1						
45	M.P S.2	M.P S.2	M.P S.2	M.P S.2	M.P S.2	M.P S.2	M.P S.2	M.P S.2	M.P S.2	M.P S.2
	M.P S.2	M.P S.2	M.P S.3							

Table 4.9
Objectives Coded to Each Item by Reviewers
Michigan Grade 4 Mathematics

46	G.GS.4	G.GS.5	G.GS.5	G.GS.5	G.GS.5	G.GS.5	G.GS.5	G.GS.5	G.GS.5	G.GS.5
	G.GS.5	G.GS.5	G.SR							
47	D.RE	D.RE.3	D.RE.3	D.RE.3	D.RE.3	D.RE.3	D.RE.3	D.RE.3	D.RE.3	D.RE.3
	D.RE.3	D.RE.3	D.RE.3							
48	N.MR.4	N.MR.4	N.MR.4	M.PS.3	M.PS.3	M.PS.3	M.PS.3	M.PS.3	M.PS.3	M.PS.3
	M.PS.3	M.PS.3	M.PS.3							
49	N.ME.5	N.ME.5	N.ME.5	N.ME.5	N.ME.5	N.ME.5	N.ME.5	N.ME.5	N.ME.5	N.ME.5
	N.ME.5	N.ME.5	N.ME.8							
50	M.UN	M.UN	M.UN	M.UN	G.SR.1	G.SR.1	G.SR.1	G.SR.1	G.SR.1	G.SR.1
	G.SR.1	G.SR.1	G.SR.1							
51	M.UN.5	M.UN.5	M.UN.5	M.UN.5	M.UN.5	M.UN.5	M.UN.5	M.UN.5	M.UN.5	M.UN.5
	M.UN.5	M.PS.4	M.PS.4							
52	M.UN	M.UN	M.UN.1	M.UN.3	M.UN.3	M.UN.3	M.UN.3	M.UN.3	M.UN.3	M.UN.3
	M.UN.3	M.UN.3	M.UN.3							
53	N.MR.2	N.MR.2	N.MR.2	N.MR.2	N.MR.2	N.MR.2	N.MR.2	N.MR.2	N.MR.2	N.MR.2
	N.MR.2	N.MR.5	N.MR.5							
54	N.FL.1	M.UN.2	M.UN.2	M.UN.2	M.UN.2	M.UN.2	M.PS.1	M.PS.1	M.PS.1	M.PS.1
	M.PS.1	M.PS.1	M.PS.1	M.PS.3						
55	M.UN.5	M.UN.5	M.UN.5	M.UN.5	M.UN.5	M.UN.5	M.UN.5	M.UN.5	M.UN.5	M.UN.5
	M.UN.5	M.PS.4	M.PS.4							
56	M.UN	M.UN.1	M.UN.1	M.UN.2	M.UN.3	M.UN.3	M.UN.3	M.UN.3	M.UN.3	M.UN.3
	M.U	M.U	M.U							

Table 4.9
Objectives Coded to Each Item by Reviewers
Michigan Grade 4 Mathematics

	N.3	N.3	N.3							
57	M.UN.5	M.UN.5	M.UN.5	M.UN.5	M.UN.5	M.UN.5	M.UN.5	M.UN.5	M.UN.5	M.TE.1
	M.PS.4	M.PS.4	M.PS.4							
58	M.UN.2	M.UN.2	M.UN.2	M.UN.2	M.UN.2	M.PS.1	M.PS.1	M.PS.1	M.PS.1	M.PS.3
	M.PS.3	M.PS.3	M.PS.4							
59										
60										
61	N.ME.1	N.ME.3	N.ME.3	N.ME.3	N.ME.3	N.ME.3	N.ME.3	N.ME.3	N.ME.3	N.ME.3
	N.ME.3	N.ME.3	N.ME.3							
62	N.ME.5	N.ME.5	N.ME.5	N.ME.5	N.ME.5	N.ME.5	N.ME.5	N.ME.5	N.ME.5	N.ME.5
	N.ME.5	N.ME.5	N.ME.8							
63	N.ME	N.ME.5	N.ME.5	N.ME.5	N.ME.5	N.ME.5	N.ME.5	N.ME.5	N.ME.5	N.ME.5
	N.ME.5	N.ME.6	N.ME.8							
64	M.UN.2	M.UN.2	M.UN.2	M.UN.2	M.UN.2	M.UN.2	M.UN.2	M.UN.3	M.PS.1	M.PS.1
	M.PS.1	M.PS.3	M.PS.3							
65	G.GS.4	G.GS.5	G.GS.5	G.GS.5	G.GS.5	G.GS.5	G.GS.5	G.GS.5	G.GS.5	G.GS.5
	G.GS.5	G.GS.5	G.GS.5							
66	N.MR.2	N.MR.2	N.MR.2	N.MR.2	N.MR.2	N.MR.5	N.MR.5	N.MR.5	N.MR.5	N.MR.5
	N.MR.5	N.MR.5	M.PS.4							
67	M.UN.1	M.UN.2	M.UN.2	M.UN.2	M.UN.2	M.UN.2	M.UN.2	M.UN.2	M.PS.1	M.PS.1
	M.PS.1	M.PS.3	M.PS.3							
68	M.UN.4	M.UN.4	M.UN.4	M.UN.4	M.UN.4	M.UN.4	M.UN.4	M.UN.4	M.UN.4	M.UN.4
	M.UN.4	M.UN.4	M.UN.4							

Table 4.9
Objectives Coded to Each Item by Reviewers
Michigan Grade 4 Mathematics

69	G.GS.4	G.GS.5	G.SR.1	G.SR.1	G.SR.1	G.SR.1	G.SR.1	G.SR.1	G.SR.1	G.SR.1
	G.SR.1	G.SR.1	G.SR.1							
70	M.UN.4	M.UN.4	M.UN.4	M.UN.4	M.UN.4	M.UN.4	M.UN.4	M.UN.4	M.UN.4	M.UN.4
	M.UN.4	M.UN.4	M.UN.4							
71	N.ME.3	N.ME.3	N.ME.3	N.ME.3	N.ME.3	N.ME.3	N.ME.3	N.ME.3	N.ME.3	N.ME.3
	N.ME.3	N.ME.3	M.PS.3							
72	N.ME.4	N.ME.4	N.ME.4	N.ME.4	N.ME.4	N.ME.4	N.ME.4	N.ME.4	N.ME.4	N.ME.4
	N.ME.4	N.ME.4	N.MR							
73	N.ME	N.ME.6	N.ME.6	N.ME.6	N.ME.6	N.ME.6	N.ME.6	N.ME.6	N.ME.6	N.ME.6
	N.ME.6	N.ME.6	N.ME.7							
74	N.ME.8	N.ME.8	N.ME.8	N.ME.8	N.ME.8	N.ME.8	N.ME.8	N.ME.8	N.ME.8	N.ME.8
	N.ME.8	N.ME.8	N.MR							
75	N.ME.4	N.MR	N.MR.3	N.MR.3	N.MR.3	N.MR.3	N.MR.3	N.MR.3	N.MR.3	N.MR.3
	N.MR.3	N.MR.3	N.MR.3							
76										
77										
78										
79	N.ME.1	N.MR.5	N.MR.5	N.MR.5	N.MR.5	N.MR.5	M.PS.2	M.PS.2	M.PS.2	M.PS.3
	M.PS.3	M.PS.3	M.PS.3	M.PS.3	M.PS.3	M.PS.3				

Table 4.10
Items Coded by Reviewers to Each Objective
Michigan Grade 4 Mathematics

Low		Medium		High
0		16.89091		62

N																				
N.ME	8	9	9	10	10	10	10	10	25	63	73									
N.ME.1	3	3	3	3	3	3	3	3	3	3	3	3	3	10	10	10	10	10	19	19
	19	19	19	61	79															
N.ME.2	8	8	8	8	8	8	8	8	8	8	8	8	9	9	9	9	9	9	9	9
	9	9	9	10	19	19	19	19	19	19	19									
N.ME.3	10	10	10	10	10	14	14	14	14	14	14	14	14	14	14	14	14	14	19	61
	61	61	61	61	61	61	61	61	61	61	61	71	71	71	71	71	71	71	71	
	71	71	71	71																
N.ME.4	16	72	72	72	72	72	72	72	72	72	72	72	72	75						
N.ME.5	25	25	25	25	25	25	49	49	49	49	49	49	49	49	49	49	49	49	62	62
	62	62	62	62	62	62	62	62	62	62	63	63	63	63	63	63	63	63	63	
	63																			
N.ME.6	25	25	63	73	73	73	73	73	73	73	73	73	73	73						
N.ME.7	73																			
N.ME.8	49	62	63	74	74	74	74	74	74	74	74	74	74	74	74					
N.ME.9	24	24	24	24	24	24	24	24	24	24	24	26	26	26	26	26	26	26	26	
N.FL	7																			
N.FL.1	1	4	4	4	4	4	4	4	4	4	4	7	7	7	7	7	7	7	11	11
	11	11	11	11	17	17	18	44	54											
N.FL.2	12	12	12	12	12	12	12	12	12	12	12	12	13	13	13	13	13	13	13	13
	13	13	13	13	15	15	15	15	15	15	15	15	15	15	15	15				
N.FL.3	2	5	16	17																
N.MR	6	16	72	74	75															

Table 4.10
Items Coded by Reviewers to Each Objective
Michigan Grade 4 Mathematics

N.MR.1	2	2	2	2	2	2	2	2	2	2	2	2	5	5	5	5	5	5	5	5
	5	5	5	6	6	6	6	6	6	6	6	6	6	6						
N.MR.2	16	16	16	16	16	16	16	16	16	16	38	38	38	38	38	38	38	38	53	53
	53	53	53	53	53	53	53	53	53	66	66	66	66	66						
N.MR.3	5	6	75	75	75	75	75	75	75	75	75	75	75							
N.MR.4	48	48	48																	
N.MR.5	1	1	1	4	4	4	7	7	7	7	7	11	11	11	11	11	11	12	12	13
	15	17	17	17	17	17	17	17	17	17	17	18	18	18	18	18	18	18	18	
	18	18	18	38	38	38	38	38	42	53	53	66	66	66	66	66	66	66	79	
	79	79	79	79																
N.MR.6	18																			
M																				
M.UN	42	42	42	42	50	50	50	50	52	52	56									
M.UN.1	22	22	22	22	22	22	22	22	22	22	22	23	23	23	23	23	23	23	23	23
	23	32	32	32	32	32	32	32	36	36	36	52	56	56	67					
M.UN.2	22	22	23	23	23	24	26	32	32	32	36	36	36	36	44	44	44	44	54	54
	54	54	54	56	58	58	58	58	58	64	64	64	64	64	64	64	67	67	67	
	67	67	67	67																
M.UN.3	32	33	36	36	36	36	36	36	52	52	52	52	52	52	52	52	52	52	56	56
	56	56	56	56	56	56	56	64												
M.UN.4	30	30	30	30	30	30	30	30	30	30	30	30	30	68	68	68	68	68	68	68
	68	68	68	68	68	68	70	70	70	70	70	70	70	70	70	70	70	70	70	
M.UN.5	42	42	42	42	42	42	42	42	51	51	51	51	51	51	51	51	51	51	51	55
	55	55	55	55	55	55	55	55	55	55	57	57	57	57	57	57	57	57	57	
M.UN.6																				
M.UN.7	25	25	25																	
M.U																				

Table 4.10
Items Coded by Reviewers to Each Objective
Michigan Grade 4 Mathematics

N.8																				
M.TE																				
M.TE.1	57																			
M.PS																				
M.PS.1	1	1	1	1	44	44	44	44	44	44	44	44	44	54	54	54	54	54	54	54
	58	58	58	58	64	64	64	67	67	67										
M.PS.2	26	26	26	28	28	28	28	28	28	28	28	28	34	34	34	34	34	34	34	34
	34	34	45	45	45	45	45	45	45	45	45	45	45	45	79	79	79			
M.PS.3	1	1	1	1	1	11	24	24	25	26	26	28	28	28	28	28	32	32	34	34
	34	34	45	48	48	48	48	48	48	48	48	48	48	54	58	58	58	64	64	
	67	67	71	79	79	79	79	79	79	79										
M.PS.4	51	51	55	55	57	57	57	58	66											
G																				
G.GS																				
G.GS.1	31	31																		
G.GS.2	43																			
G.GS.3																				
G.GS.4	31	31	31	31	41	41	41	41	41	43	43	46	65	69						
G.GS.5	41	41	41	41	41	41	41	41	43	43	43	43	43	43	43	43	43	43	46	46
	46	46	46	46	46	46	46	46	46	65	65	65	65	65	65	65	65	65	65	
	65	65	69																	
G.SR	46																			
G.SR.1	31	31	31	31	31	31	31	50	50	50	50	50	50	50	50	50	69	69	69	69
	69	69	69	69	69	69	69													
G.SR.2																				
D	9																			
D.R	37	47																		

Table 4.10
Items Coded by Reviewers to Each Objective
Michigan Grade 4 Mathematics

E																				
D.R E.1	27	27	29	29	29	33	33													
D.R E.2	27	27	27	27	27	27	27	27	27	27	27	27	29	29	29	29	29	29	29	29
	29	29	29	32	33	33	33	33	33	33	33	33	33	35	35	35	35	35	35	
	35	35	35																	
D.R E.3	33	33	35	35	35	35	35	37	37	37	37	37	37	37	37	37	37	37	37	47
	47	47	47	47	47	47	47	47	47	47	47									

Table 4.11
Number of Reviewers Coding an Item by Objective (Item Number: Number of Reviewers)
Michigan Grade 4 Mathematics

Low		Medium		High
1		6		13

N								
N.ME	8:1	9:2	10:5	25:1	63:1	73:1		
N.ME.1	3:13	10:5	19:5	61:1	79:1			
N.ME.2	8:12	9:11	10:1	19:7				
N.ME.3	10:5	14:13	19:1	61:12	71:12			
N.ME.4	16:1	72:12	75:1					
N.ME.5	25:6	49:12	62:12	63:10				
N.ME.6	25:2	63:1	73:11					
N.ME.7	73:1							
N.ME.8	49:1	62:1	63:1	74:12				
N.ME.9	24:11	26:8						
N.FL	7:1							
N.FL.1	1:1	4:10	7:7	11:6	17:2	18:1	44:1	54:1
N.FL.2	12:12	13:12	15:12					
N.FL.3	2:1	5:1	16:1	17:1				
N.MR	6:1	16:1	72:1	74:1	75:1			
N.MR.1	2:12	5:11	6:11					
N.MR.2	16:10	38:8	53:11	66:5				
N.MR.3	5:1	6:1	75:11					
N.MR.4	48:3							

Table 4.11

Number of Reviewers Coding an Item by Objective (Item Number: Number of Reviewers)
Michigan Grade 4 Mathematics

N.MR.5	1:3	4:3	7:5	11:6	12:2	13:1	15:1	17:10	18:11	38:5	42:1	53:2	66:7
	79:5												
N.MR.6	18:1												
M													
M.UN	42:4	50:4	52:2	56:1									
M.UN.1	22:11	23:10	32:7	36:3	52:1	56:2	67:1						
M.UN.2	22:2	23:3	24:1	26:1	32:3	36:4	44:4	54:5	56:1	58:5	64:7	67:7	
M.UN.3	32:1	33:1	36:6	52:10	56:9	64:1							
M.UN.4	30:13	68:13	70:13										
M.UN.5	42:8	51:11	55:11	57:9									
M.UN.6													
M.UN.7	25:3												
M.UN.8													
M.TE													
M.TE.1	57:1												
M.PS													
M.PS.1	1:4	44:9	54:7	58:4	64:3	67:3							
M.PS.2	26:3	28:9	34:10	45:12	79:3								
M.PS.3	1:5	11:1	24:2	25:1	26:2	28:5	32:2	34:4	45:1	48:10	54:1	58:3	64:2
	67:2	71:1	79:7										
M.PS.4	51:2	55:2	57:3	58:1	66:1								
G													
G.GS													
G.G	31:2												

Table 4.11
Number of Reviewers Coding an Item by Objective (Item Number: Number of Reviewers)
Michigan Grade 4 Mathematics

S.1						
G.GS.2	43:1					
G.GS.3						
G.GS.4	31:4	41:5	43:2	46:1	65:1	69:1
G.GS.5	41:8	43:10	46:11	65:12	69:1	
G.SR	46:1					
G.SR.1	31:7	50:9	69:11			
G.SR.2						
D	9:1					
D.RE	37:1	47:1				
D.RE.1	27:2	29:3	33:2			
D.RE.2	27:12	29:11	32:1	33:9	35:9	
D.RE.3	33:2	35:5	37:12	47:12		

Table 4.13
Assessment Item DOK vs Consensus DOK (Item Number: Number of Reviewers [Average DOK])
Michigan Grade 4 Mathematics

Low DOK		Matched DOK		High DOK
1		6		13

N [2]:								
N.ME [1]:	8:1[1]	9:2[2]	10:5[2]	25:1[1]	63:1[2]	73:1[2]		
N.ME.1 [1]:	3:13[1]	10:5[2.2]	19:5[1]	61:1[1]	79:1[3]			
N.ME.2 [1]:	8:12[1]	9:11[1.64]	10:1[1]	19:7[1]				
N.ME.3 [1]:	10:5[2]	14:13[1.08]	19:1[1]	61:12[1.17]	71:12[1.83]			
N.ME.4 [1]:	16:1[1]	72:12[1.5]	75:1[1]					
N.ME.5 [1]:	25:6[1.67]	49:12[1.25]	62:12[1.08]	63:10[2]				
N.ME.6 [2]:	25:2[1]	63:1[2]	73:11[1.64]					
N.ME.7 [2]:	73:1[2]							
N.ME.8 [1]:	49:1[2]	62:1[1]	63:1[2]	74:12[2.08]				
N.ME.9 [1]:	24:11[1]	26:8[1]						
N.FL [1]:	7:1[2]							
N.FL.1 [1]:	1:1[1]	4:10[1.3]	7:7[1.57]	11:6[1.83]	17:2[2]	18:1[2]	44:1[1]	54:1[2]

Table 4.13
Assessment Item DOK vs Consensus DOK (Item Number: Number of Reviewers [Average DOK])
Michigan Grade 4 Mathematics

N.FL.2 [2]:	12:12[2]	13:12[1.92]	15:12[2]										
N.FL.3 [1]:	2:1[1]	5:1[1]	16:1[1]	17:1[2]									
N.MR [2]:	6:1[1]	16:1[1]	72:1[1]	74:1[3]	75:1[1]								
N.MR.1 [2]:	2:12[1]	5:11[1]	6:11[1]										
N.MR.2 [2]:	16:10[1.8]	38:8[1.88]	53:11[1.91]	66:5[2.2]									
N.MR.3 [2]:	5:1[1]	6:1[1]	75:11[1.36]										
N.MR.4 [2]:	48:3[2]												
N.MR.5 [2]:	1:3[1]	4:3[1]	7:5[1.6]	11:6[1.83]	12:2[2]	13:1[2]	15:1[2]	17:10[1.9]	18:11[1.91]	38:5[2]	42:1[2]	53:2[2]	66:7[2]
	79:5[3.2]												
N.MR.6 [2]:	18:1[1]												
M [1]:													
M.UN [1]:	42:4[1.75]	50:4[2]	52:2[1.5]	56:1[2]									
M.UN.1 [1]:	22:11[1.09]	23:10[1.1]	32:7[1.43]	36:3[1]	52:1[2]	56:2[1.5]	67:1[2]						
M.UN.2 [1]:	22:2[1]	23:3[1]	24:1[2]	26:1[1]	32:3[1.67]	36:4[1.25]	44:4[1.75]	54:5[2]	56:1[2]	58:5[1.8]	64:7[1.86]	67:7[1.86]	
M.UN.3 [2]:	32:1[2]	33:1[1]	36:6[1.17]	52:10[1.7]	56:9[1.67]	64:1[2]							

Table 4.13
Assessment Item DOK vs Consensus DOK (Item Number: Number of Reviewers [Average DOK])
Michigan Grade 4 Mathematics

M.UN.4[1]:	30:13[1.15]	68:13[1.08]	70:13[1.38]										
M.UN.5[1]:	42:8[1.38]	51:11[1.45]	55:11[1.45]	57:9[1.56]									
M.UN.6[1]:													
M.UN.7[1]:	25:3[1]												
M.UN.8[1]:													
M.TE[2]:													
M.TE.1[2]:	57:1[2]												
M.PS[2]:													
M.PS.1[2]:	1:4[1]	44:9[2.11]	54:7[2]	58:4[2]	64:3[2.33]	67:3[2.67]							
M.PS.2[1]:	26:3[1]	28:9[1.44]	34:10[1.4]	45:12[1.5]	79:3[3]								
M.PS.3[2]:	1:5[1]	11:1[2]	24:2[1]	25:1[1]	26:2[1]	28:5[1.4]	32:2[1.5]	34:4[1.5]	45:1[1]	48:10[1.9]	54:1[2]	58:3[1.67]	64:2[3]
	67:2[2]	71:1[2]	79:7[2.86]										
M.PS.4[2]:	51:2[2]	55:2[2]	57:3[2]	58:1[1]	66:1[3]								
G[2]:													
G.GS													

Table 4.13
Assessment Item DOK vs Consensus DOK (Item Number: Number of Reviewers [Average DOK])
Michigan Grade 4 Mathematics

[1]:						
G.GS.1 [1]:	31:2 [1.5]					
G.GS.2 [1]:	43:1 [1]					
G.GS.3 [1]:						
G.GS.4 [2]:	31:4 [1.75]	41:5 [1.8]	43:2 [1]	46:1 [1]	65:1 [2]	69:1 [2]
G.GS.5 [3]:	41:8 [1.38]	43:10[1]	46:11[1.82]	65:12[1.83]	69:1 [3]	
G.SR [2]:	46:1 [1]					
G.SR.1 [2]:	31:7 [1.29]	50:9 [2.22]	69:11[2.09]			
G.SR.2 [2]:						
D [2]:	9:1[2]					
D.RE [2]:	37:1 [2]	47:1 [3]				
D.RE.1 [2]:	27:2 [1.5]	29:3 [1.67]	33:2 [1.5]			
D.RE.2 [2]:	27:12[1.75]	29:11[1.73]	32:1 [2]	33:9 [1.56]	35:9 [2]	
D.RE.3 [2]:	33:2 [2]	35:5 [2]	37:12[2.17]	47:12[2.17]		

Table 5.1
Categorical Concurrence Between Standards and Assessment as Rated by Twelve Reviewers
Michigan Grade 5 Mathematics
Number of Assessment Items - 70

Standards			Level by Objective			Hits		Cat. Concurr.
Title	Goals #	Objs #	Level	# of objs by Level	% w/in std by Level	Mean	S.D.	
N - Number & Operations	3	37.75	1 2	17 20	45 54	32.92	1.38	YES
M - Measurement	2	11.08	1 2	5 6	45 54	17.5	0.5	YES
G - Geometry	3	5.58	1 2	4 1	80 20	10.83	0.37	YES
D - Data & Probability	1	3.08	2	3	100	9.17	1.07	YES
Total	9	57.5	1 2	26 30	46 53	70.42	1.11	

Table 5.2
Depth-of-Knowledge Consistency Between Standards and Assessment as Rated by Twelve Reviewers
Michigan Grade 5 Mathematics
Number of Assessment Items - 70

Standards			Hits		Level of Item w.r.t. Standard						DOK Consistency
					% Under		% At		% Above		
Title	Goals #	Objs #	M	S.D.	M	S.D.	M	S.D.	M	S.D.	
N - Number & Operations	3	37.75	32.92	1.38	30	42	62	44	8	26	YES
M - Measurement	2	11.08	17.5	0.5	18	32	66	36	16	28	YES
G - Geometry	3	5.58	10.83	0.37	8	23	63	44	29	43	YES
D - Data & Probability	1	3.08	9.17	1.07	10	18	67	38	23	39	YES
Total	9	57.5	70.42	1.11	22	37	63	42	15	32	

Table 5.3
Range-of-Knowledge Correspondence and Balance of Representation Between Standards and Assessment as Rated by Twelve Reviewers
Michigan Grade 5 Mathematics
Number of Assessment Items - 70

Standards			Hits		Range of Objectives				Rng. of Know.	Balance Index				Bal. of Represent.
					# Objs Hit		% of Total			% Hits in Std/Ttl Hits		Index		
Title	Goals #	Objs #	Mean	S.D.	Mean	S.D.	Mean	S.D.		Mean	S.D.	Mean	S.D.	
N - Number & Operations	3	37.75	32.92	1.38	17.5	1.32	46	3	WEAK	47	2	0.76	0.03	YES
M - Measurement	2	11.08	17.5	0.5	7	0.58	63	5	YES	25	1	0.81	0.05	YES
G - Geometry	3	5.58	10.83	0.37	5.5	0.5	99	4	YES	15	1	0.80	0.04	YES
D - Data & Probability	1	3.08	9.17	1.07	2.92	0.28	95	11	YES	13	1	0.83	0.08	YES
Total	9	57.5	70.42	1.11	8.23	5.60	76	23		25	13	0.80	0.06	

Table 5.4
Summary of Attainment of Acceptable Alignment Level on Four Content Focus Criteria as Rated by Twelve Reviewers
Michigan Grade 5 Mathematics
Number of Assessment Items - 70

Standards	Alignment Criteria			
	Categorical Concurrence	Depth-of-Knowledge Consistency	Range of Knowledge	Balance of Representation
N - Number & Operations	YES	YES	WEAK	YES
M - Measurement	YES	YES	YES	YES
G - Geometry	YES	YES	YES	YES
D - Data & Probability	YES	YES	YES	YES

Table 5.5
Source-of-Challenge Issues by Reviewer
Michigan Grade 5 Mathematics

Item Number	Comments by Reviewer
2	It is unclear to me why the problem asks for the 'greatest number' of apples that can be bought for $2. In any store I've been to, if you paid $2, you would get the same quantity of apples as any other customer who paid $2.
4	The first sentence does not make it clear that the $39 is to pay for the purchase of the freezer rather than the cost to operate it.
5	The two sentences are not parallel. Either the first sentence should read that 144 is a square number because it can be represented by a square grid or the second sentence should ask which number should be represented by a square grid.
5	No GLCE addresses square numbers
21	No GLCE seems to deal with Make A Chart or Table and look for a pattern of increase
45	no special GLCE; decomposing a hexagon into triangles
64	This is a poor data set, and would easily lend itself to student confusion.
64	The Data table is set up in a way that many students may not understand how to interpret the data.
75	The patterns on the figures are distracting, especially for the coffee mug because the line of stars nearly mimics a line of symmetry.

Table 5.6
Depth-of-Knowledge Levels by Item and Reviewers
Intraclass Correlation
Michigan Grade 5 Mathematics

Item	Rater 1	Rater 2	Rater 3	Rater 4	Rater 5	Rater 6	Rater 7	Rater 8	Rater 9	Rater 10	Rater 11	Rater 12
1	1	1	1	1	1	1	1	1	1	1	1	1
2	1	2	2	1	2	2	2	2	2	2	2	2
3	2	2	2	2	2	2	2	2	2	2	2	2
4	1	2	2	3	1	2	2	1	2	2	2	1
5	1	2	2	1	2	2	2	2	2	2	2	2
6	1	2	1	1	2	2	2	2	1	1	2	2
7	1	1	1	1	1	1	1	1	1	1	1	1
8	1	2	2	2	2	1	2	2	2	2	1	2
9	1	2	2	2	2	2	2	2	2	2	1	2
10	1	2	2	2	2	2	2	2	2	2	1	2
11	1	1	1	1	1	1	1	1	1	1	1	1
12	1	1	2	1	1	1	1	1	2	1	1	2
13	1	1	1	1	1	1	1	1	1	1	1	1
14												
15												
16	1	2	2	1	1	1	1	1	2	2	1	2
17	2	2	2	2	2	2	2	2	2	2	3	3
18	1	2	1	1	1	1	1	1	2	1	1	1
19	2	2	2	1	1	1	1	1	2	1	1	2
20	1	2	2	2	1	1	1	1	2	2	2	2
21	2	2	2	2	2	2	1	2	2	2	2	2
22	1	1	1	1	1	1	1	1	1	1	1	1
23	2	1	1	1	2	2	1	2	1	1	1	2
24	1	1	2	1	1	1	1	1	1	1	1	2
25	1	1	2	2	1	1	1	1	1	1	2	1
26	1	1	1	1	1	2	1	1	1	1	1	1
27	1	1	2	1	1	2	1	2	1	1	1	1
28	1	2	2	2	1	1	1	1	1	1	1	2
29	2	2	2	2	1	2	1	2	2	2	2	3
30	1	1	1	1	1	1	1	1	1	1	1	1
31	2	2	2	2	2	2	2	2	2	2	2	2
32	1	1	1	1	1	1	1	1	1	1	1	1
33	1	2	2	2	1	1	1	1	2	1	2	2
34	1	2	1	1	1	1	1	1	2	1	2	2
35	1	1	2	2	1	1	1	1	1	1	1	1
36	1	1	2	1	1	1	1	1	1	1	2	1
37												
38												
39												
40	1	2	1	1	1	1	1	1	1	1	2	1
41	1	1	1	1	1	1	1	1	1	1	1	1
42	2	2	2	3	2	2	2	2	2	2	3	3
43	2	1	2	2	1	2	1	2	2	1	2	2
44	1	1	1	2	1	2	1	1	2	2	2	1
45	2	2	1	2	2	2	2	2	2	2	2	2
46	2	2	2	1	1	2	1	1	2	2	2	2
47	1	1	1	1	1	1	1	1	1	1	1	1
48	1	2	1	2	1	2	1	1	1	2	2	1
49	1	1	1	1	1	2	1	1	2	1	2	2
50	2	1	2	1	2	2	2	1	2	2	2	2
51	1	1	1	1	1	1	1	2	1	1	1	2
52	1	2	2	1	2	2	1	2	2	2	2	2

Table 5.6
Depth-of-Knowledge Levels by Item and Reviewers
Intraclass Correlation
Michigan Grade 5 Mathematics

53	1	1	2	1	1	1	1	1	2	1	2	1
54	1	2	2	2	1	2	2	3	2	2	3	3
55	1	2	2	2	1	1	1	1	1	1	2	2
56	2	2	2	2	1	2	2	3	2	2	2	3
57	1	1	2	2	1	1	1	1	2	1	2	2
58	1	2	2	1	2	2	1	2	2	2	2	2
59	1	2	2	1	1	2	1	2	2	1	2	2
60												
61												
62	1	1	1	1	1	1	1	2	1	1	1	2
63	1	2	2	2	1	2	2	2	2	2	2	2
64	1	3	3	3	2	3	2	3	2	2	3	3
65	1	1	1	1	1	1	1	2	1	1	2	2
66	1	2	2	2	1	2	2	3	2	2	2	3
67	2	2	2	2	1	1	1	2	2	1	1	2
68	1	2	1	1	1	1	1	1	1	1	2	1
69	2	2	2	2	2	1	2	2	2	2	2	2
70	1	1	1	1	1	1	1	2	1	1	2	2
71	1	1	1	2	1	1	1	2	2	1	2	2
72	2	2	2	2	2	2	2	2	2	2	2	2
73	2	2	2	2	2	2	2	2	2	2	2	2
74	1	1	1	1	1	1	1	1	1	1	2	1
75	1	2	2	2	1	1	1	1	1	1	1	2
76												
77												
78	1	1	2	2	2	1	1	1	1	1	1	1
79	2	2		3	2	3	2	4	2	2	3	4

Intraclass Correlation: 0.9093
Pairwise Comparison: 0.6608

Table 5.7
Notes by Reviewer
Michigan Grade 5 Mathematics

Item Number	Comments by Reviewer
1	Nobody says they were born in year 'one thousand nine hundread and forty two.' The problem would be better with a more appropriate context.
2	Also using Dre. 3 Could it also be extending and using a pattern?
4	This is a nice problem, but there is not a standard that really fits. I made a stretch with NFL5 because it says applied problems.
4	NO objective seems to come close
6	MNR2. or ME4
8	Doesn't actually involve multiplication
10	USES COMMUN. & DISTRIBUT.
16	MFL4
17	This is a contrived unrealistic problem that a 4th grader may not relate to. Redo this one.
23	Read my comments from grade 4 test for this problem.
28	The term "reflection" is not used in all 4th grade texts. It is called a "flip". In my district "reflection", "rotations" etc. were introduced in 5th grade.
28	g.tr.2 does not cover reflections
29	There is no expectation that explicitly addresses patterns.
29	This standard should be labeled as DRE not GRE
41	Much too easy.
41	unbelievably easy- :0
44	GRE is DRE
48	Assumes the child has knowledge about desirable growing conditions for plants.
49	MUN4
50	There is no expectation that explicitly addresses patterns.
50	Should be DRE
54	COMPARISON OF 1/2 of distance between 1/2 and 3/4. Could also be estimate.
56	GRE should be DRE
64	GRE3
79	DRE1,MR15

Table 5.8
DOK Levels and Objectives Coded by Each Reviewer
Michigan Grade 5 Mathematics

Item	DOK 0	PObj 0	S1Obj0	DOK 1	PObj 1	DOK 2	PObj 2	DOK 3	PObj 3	S1Obj3	DOK 4	PObj 4	DOK 5	PObj 5	DOK 6	PObj 6	DOK 7	PObj 7	S1Obj7	DOK 8	PObj 8	S1Obj8	DOK 9	PObj 9	S1Obj9	DOK 10	PObj 10	DOK 11	PObj 11	S1Obj11
1	1	N.ME.1		1	N.ME.1	1	N.ME.1	1	N.ME.1		1	N.ME.1	1	N.ME.1	1	N.ME.1	1	N.ME.1		1	N.ME.1		1	N.ME.1		1	N.ME.1	1	N.ME.2	
2	1	N.ME.7		2	N.MR.15	2	G.RE.3	1	N.ME.7	G.RE.3	2	G.RE.3	2	N.MR	2	G.RE.3	2	G.RE.3		2	G.RE.3		2	G.RE.3		2	N.MR.15	2	N.MR.15	
3	2	N.MR.15		2	N.MR.15	2	N.MR.15	2	N.MR.15		2	N.MR.15	2	N.FL.1	2	N.MR.15	2	N.MR.15		2	N.MR.15		2	N.MR.15		2	N.FL.1	2	N.MR.15	
4	1	N.MR.2		2	N.MR.15	2	N.MR	3	N.FL.5		1		2		2	N.FL.5	1	N.MR		2	N.FL.5		2	N.FL.5		2	N.MR.15	1	N.FL	
5	1	N.MR.2		2	N.MR	2	N.MR.2	1	N.MR.2		2	N.MR.2	2	N.MR.2	2	N.MR.2	2	N.MR.2		2	G.GS.2		2	N.FL.5		2	N.FL.5	2	N.MR.2	
6	1	N.MR.1		2	N.FL.5	1	N.FL.5	1	N.MR.15		2	N.ME.4	2	N.MR.1	2	N.ME.4	2	N.MR.2		1	N.MR.2		1	N.MR.1		2	N.MR.1	2	N.ME.4	
7	1	N.FL.2		1	N.FL.2	1	N.MR.2	1	N.MR.2		1	N.FL.2	1	N.FL.2	1	N.FL.2	1	N.FL.2		1	N.ME.4		1	N.ME.4		1	N.FL.5	1	N.ME.4	
8	1	N.FL		2	N.FL.2	2	N.ME.6	2	N.ME.6		2	N.ME.6	1	N.ME.6	2	N.ME.6	2	N.ME.6		2	N.ME.6		2	N.ME.6		1	N.ME.6	2	N.ME.6	
9	1	N.FL		2	N.FL.2	2	N.ME.6	2	N.ME.6		2	N.ME.6	2	N.ME.6	2	N.ME.6	2	N.ME.6		2	N.ME.6		2	N.ME.6		1	N.ME.6	2	N.ME.6	
10	1	N.FL.2		2	N.FL.2	2	N.ME.6	2	N.ME.6		2	N.ME.6	2	N.ME.6	2	N.ME.6	2	N.ME.6		2	N.ME.6		2	N.ME.6		1	N.ME.6	2	N.ME.6	
11	1	N.ME.5		1	N.ME.5	1	N.ME.5	1	N.ME.5		1	N.MR.2	1	N.MR.2	1	N.MR.2	1	N.ME.5		1	N.ME.5		1	N.ME.5		1	N.ME.5	1	N.ME.5	
12	1	N.FL.2		1	N.ME.4	2	N.MR.2	1	N.MR.2		1	N.MR.2	1	N.MR.2	1	N.MR.2	1	N.MR.2		2	N.ME.4		1	N.MR.2		1	N.FL.5	2	N.MR.2	
13	1	N.MR.1		1	N.MR.1	1	N.MR.1	1	N.MR.1		1	N.MR.2	1	N.MR.2	1	N.MR.2	1	N.MR.2		1	N.ME.4		1	N.ME.4		1	N.MR.1	1	N.MR.1	
14																														
15																														
16	1	N.FL.4		2	N.FL.4	2	N.FL.4	1	N.FL.4		1	N.MR.3	1	N.MR.3	1	N.MR.3	1	N.MR.3		2	N.FL.4		2	N.FL.4		1	N.FL.4	2	N.MR.6	
17	2	N.FL.5		2	N.MR	2	N.MR.2	2	N.MR.2		2	N.ME.4	2	N.ME.4	2	N.ME.4	2	N.ME.4		2	N.MR.2		2	N.MR.2		3	N.ME.5	3	N.ME.4	
18	1	N.FL.5		2	N.FL.3	1	N.FL.3	1	N.FL.3		1	N.FL.3	1	N.FL.3	1	N.FL.3	1	N.FL.3		2	N.FL.3		1	N.FL.3		1	N.FL.5	1	N.FL.2	
19	2	N.FL.5		2	N.FL.5	2	N.FL.5	1	N.FL.3		1	N.FL.5	1	N.FL.5	1	N.FL.5	1	N.FL.5		2	N.FL.5		1	N.FL.3		1	N.FL.5	2	N.FL.3	
20	1	N.MR.12		2	N.MR.12	2	N.MR.12	2	N.MR.12		1	N.MR.12	1	N.MR.12	1	N.MR.12	1	N.MR.12		2	N.MR.12		2	N.MR.12		2	N.MR.12	2	N.MR.12	
21	2	N.MR.15		2	N.MR	2	N.MR.15	2	N.MR.15		2	N.MR.15	2	N.MR.15	1	N.MR.15	2	N.MR.15		2	N.MR.15		2	N.MR.15		2	N.FL	2	N.MR.15	
22	1	N.MR.2		1	N.ME.5	1	N.ME.5	1	N.ME.5		1	N.ME.5	1	N.ME.5	1	N.ME.5	1	N.ME.5		1	N.ME.5		1	N.ME.5		1	N.ME.5	1	N.ME.5	
23	2	N.MR.15	N.ME.7	1	N.MR.15	1	N.MR.15	1	N.MR		2	N.FL.8	2	N.MR.3	1	N.FL.8	2	N.MR.15		1	N.MR.8		1	N.FL.8		1	N.MR.15	2	N.MR.15	

Table 5.8
DOK Levels and Objectives Coded by Each Reviewer
Michigan Grade 5 Mathematics

24	1	M.UN.2		1	M.UN.2	2	M.UN.2	1	M.UN.2		1	M.UN	1	M.UN.2	1	M.UN.2	1	M.UN.2		1	M.UN.2		1	M.UN.2		1	M.UN.2	2	M.UN.2	
25	1	M.UN.1		1	M.UN.1	2	M.UN.3	2	M.UN.3		1	M.UN.1	1	M.UN.1	1	M.UN.1	1	M.UN.1		1	M.UN.1		1	M.UN.3		2	M.UN.1	1	M.UN.1	
26	1	N.ME.8		1	N.MR.4	1	N.ME.8	1	N.ME.8		1	N.ME.8	2	N.ME.8	1	N.ME.8	1	N.ME.8		1	N.ME.7		1	N.ME.8		1	N.MR.4	1	N.ME.8	
27	1	N.ME.7		1	N.ME.7	2	N.ME.7	1	N.ME.7		1	N.ME.7	2	N.ME.7	1	N.ME.7	2	N.ME.7		1	N.ME.7		1	N.ME.7		1	N.ME.7	1	N.ME.7	
28	1	G.TR.2		2	G.TR.2	2	G.TR.2	2	G.TR.2		1	G.TR.2	1	G.TR.1	1	G.TR.2	1	G.TR.2		1	G.TR.2		1	G.TR.2		1	G.TR.2	2	G.TR.2	
29	2	N.MR.2		2	N.MR	2	G.RE.3	2	G.RE.3		1	G.RE.3	2	G.RE.3	1	G.RE.3	2	G.RE.3		2	N.MR.2		2	G.RE.3		2	G.RE.3	3	G.RE.3	
30	1	M.UN.1		1	M.UN.1	1	M.UN.1	1	M.UN.1		1	M.UN.1	1	M.UN.1	1	M.UN.1	1	M.UN.1		1	M.UN.1		1	M.UN.1		1	M.UN.2	1	M.UN.1	
31	2	M.UN.4		2	M.UN.4	2	M.TE.3	2	M.UN.4		2	M.UN.4	2	M.UN.4	2	M.UN.4	2	M.TE.4		2	M.TE.3		2	M.UN.4		2	M.UN.4	2	M.TE.3	
32	1	N.ME.8		1	N.ME.8	1	N.ME.8	1	N.ME.8		1	N.ME.7	1	N.ME.7	1	N.ME.7	1	N.ME.8		1	N.ME.7		1	N.ME.8		1	N.ME.8	1	N.ME.8	
33	1	G.SR.1		2	G.SR.1	2	G.SR.1	2	G.SR.1		1	G.SR.1	1	G.SR.1	1	G.SR.1	1	G.SR.1		2	M.UN.5		1	G.SR.1		2	G.SR.1	2	G.SR.1	
34	1	N.MR.6		2	N.MR.6	1	N.MR.8	1	N.MR.6		1	N.MR.6	1	N.MR.6	1	N.MR.6	1	N.MR.6		2	N.MR.6		1	N.MR.6		2	N.MR.6	2	N.MR.6	
35	1	G.TR.2		1	G.TR.2	2	G.TR.2	2	G.TR.2		1	G.TR.2	1	G.TR.2	1	G.TR.2	1	G.TR.2		1	G.TR.2		1	G.TR.2		1	G.TR.2	1	G.TR.2	
36	1	M.UN.1		1	M.UN.1	2	M.UN.1	1	M.UN.1		1	M.UN.1	1	M.UN.1	1	M.UN.1	1	M.UN.1		1	M.UN.1		1	M.UN.1		2	M.UN.1	1	M.UN.1	
37																															
38																															
39																															
40	1	N.ME.10		2	N.ME.10	1	N.MR.4	1	N.ME.8		1	N.ME.8	1	N.ME.8	1	N.ME.8	1	N.ME.7		1	N.ME.10		1	N.ME.8		2	N.ME.10	1	N.ME.7	
41	1	M.UN.1		1	M.UN.1	1	M.UN.1	1	M.UN.1		1	M.UN	1	M.UN.1	1	M.UN.1	1	M.UN.1		1	M.UN.1		1	M.UN.1		1	M.UN.1	1	M.UN.1	
42	2	M.TE.3		2	M.UN.5	2	N.MR.15	3	M.UN.4		2	M.TE.3	2	M.UN.4	2	M.TE.3	2	M.TE.3		2	M.UN.4		2	M.UN.4		3	M.UN.4	3	M.UN.4	
43	2	N.MR.10		1	N.MR.5	2	N.MR.7	2	N.MR.5		1	N.MR.5	2	N.MR.5	1	N.MR.5	2	N.MR.5		2	N.MR.7		1	N.MR.7		2	N.MR.11	2	N.MR.5	
44	1	G.RE.3		1	G.RE.3	1	G.RE.3	2	G.RE.3		1	G.RE.3	2	G.RE.3	1	G.RE.3	1	G.RE.3		2	G.RE.3		2	G.RE.3		2	G.RE.3	1	G.RE.3	
45	2	G.SR.1		2	G	1	M.UN.4	2	G.GS.2		2	G.SR	2	G.SR.1	2	G.SR	2	G.GS.2		2	G.GS.2		2	G.SR		2	G.SR	2	G.GS.2	
46	2	M.TE.3		2	M.UN.4	2	M.UN.4	1	M.UN.4		1	M.UN.4	2	M.UN.5	1	M.UN.4	1	M.TE.3		2	M.TE.3		2	M.UN.4		2	M.TE.4	2	M.TE.3	
47	1	M.UN.2		1	M.UN.2	1	M.UN.2	1	M.UN.2		1	M.UN.2	1	M.UN.3	1	M.UN.2	1	M.UN.2		1	M.UN.2		1	M.UN.2		1	M.UN.3	1	M.UN.2	

Table 5.8
DOK Levels and Objectives Coded by Each Reviewer
Michigan Grade 5 Mathematics

48	1	M.UN.3		2	M.UN.1	1	M.UN.3	2	M.UN.3		1	M.UN	2	M.UN.1	1	M.UN.3	1	M.UN.2		1	M.UN.2		2	M.UN.3		2	M.UN.3	1	M.UN.1	
49	1	M.UN.4		1	M.TE.3	1	M.TE.3	1	M.UN.4		1	M.TE.3	2	M.TE.3	1	M.TE.3	1	M.UN.4		2	M.UN.4		1	M.UN.4		2	M.UN.4	2	M.UN.4	
50	2	N.MR.15		1	N.MR	2	G.RE.3	1	G.RE.3		2	N.MR.14	2	G.RE.3	2	G.RE.3	1	N.MR.15		2	G.RE.3		2	G.RE.3		2	G.RE.3	2	N.MR.15	
51	1	M.UN.2		1	M.UN.2	1	M.UN.2	1	M.UN.2		1	M.UN.2	1	M.UN.1	1	M.UN.2	2	M.UN.2		1	M.UN.2		1	M.UN.1		1	M.UN.2	2	M.UN.1	
52	1	M.TE.4		2	M.TE.4	2	M.TE.4	1	M.TE.4		2	M.TE.4	2	M.UN.5	1	M.TE.5	2	M.TE.4		2	M.TE.4		2	M.TE.4		2	M.TE.4	2	M.TE.4	
53	1	G.SR.1		1	G.SR.1	2	G.SR.1	1	G.GS.1		1	G.SR.1	1	G.GS.1	1	G.SR.1	1	G.SR.1		2	G.SR.1		1	G.SR.1		2	G.TR	1	G.GS.1	
54	1	N.FL.11		2	N.MR.15	2	N.MR.15	2	N.MR.15		1	N.MR.6	2	N.MR.7	2	N.FL.11	3	M.UN.3		2	N.FL.11		2	N.FL.11		3	N.MR.15	3	M.UN.3	
55	1	G.SR		2	G.SR.1	2	G.SR.1	2	G.SR.1		1	G.GS.1	1	G.GS.2	1	G.SR.1	1	G.SR.1		1	G.SR.1		1	G.SR.1		2	G.SR.1	2	G.SR.1	
56	2	N.MR.15		2	G.RE.3	2	G.RE.3	2	G.RE.3		1	N.MR.15	2	G.RE.3	2	G.RE.3	3	G.RE.3		2	G.RE.3		2	G.RE.3		2	G.RE.3	3	G.RE.3	
57	1	G.GS.2		1	G.GS.2	2	G.GS.2	2	G.GS.2		1	G.GS.2	1	G.GS.2	1	G.GS.2	1	G.GS.2		2	G.GS.2		1	G.GS.2		2	G.GS.2	2	G.GS.2	
58	1	M.TE.4		2	M.TE.4	2	M.TE.4	1	M.TE.4		2	M.TE.4	2	M.UN.5	1	M.UN.4	2	M.TE.4		2	M.TE.4		2	M.TE.4		2	M.TE.5	2	M.TE.4	
59	1	M.UN.3		2	M.UN.3	2	N.MR.15	1	M.UN.3		1	N.FL.7	2	N.FL	1	N.FL.11	2	N.MR.14		2	N.MR.15		1	N.FL.7		2	N.MR.14	2	N.MR.14	
60																															
61																															
62	1	N.MR.4		1	N.ME.8	1	N.MR.4	1	N.MR.4		1	N.ME.10	1	N.MR.4	1	N.ME.7	2	N.ME.7		1	N.ME.10		1	N.ME.7		1	N.ME.7	2	N.ME.7	
63	1	M.TE.6		2	G.GS.2	2	G.GS.2	2	G.GS.2		1	G.GS.2	2	G.GS.2	2	G.GS.2	2	G.GS.2		2	G.GS.2		2	G.GS.2		2	G.GS.2	2	G.GS.2	
64	1	G.RE.1		3	G.RE.1	3	G.RE.1	3	G.RE.1		2	G.RE.1	3	G.RE.1	2	G.RE.2	3	G.RE.1		2	G.RE.1		2	G.RE		3	G.RE.1	3	G.RE.1	
65	1	N.FL.11		1	M.UN.1	1	M.UN.1	1	M.UN.3		1	M.UN.1	1	M.UN.2	1	M.UN.1	2	M.UN.1		1	M.UN.1		1	M.UN.1		2	M.UN.1	2	M.UN.1	
66	1	M.TE.2		2	M.TE.2	2	M.TE.2	2	M.TE.2		1	M.TE.2	2	M.TE.2	2	M.TE.2	3	M.TE.2		2	M.TE.2		2	M.TE.2		2	M.TE.2	3	M.TE.2	
67	2	N.ME.10		2	N.MR.15	2	N.MR.4	2	N.ME.10		1	N.ME.8	1	N.MR.4	1	N.ME.8	2	N.ME.7		2	N.ME.10		1	N.ME.8		1	N.MR.4	2	N.ME.7	
68	1	N.MR.6		2	N.MR.6	1	N.MR.8	1	N.MR.6		1	N.MR.6	1	N.MR.6	1	N.MR.6	1	N.MR.6		1	N.MR.6		1	N.MR.6		2	N.MR.7	1	N.MR.6	
69	2	G.RE.2		2	G.RE.2	2	G.RE.2	2	G.RE.2		2	G.RE.2	1	G.RE.3	2	G.RE.2	2	G.RE.2		2	G.RE.2		2	G.RE.2		2	G.RE.2	2	G.RE.2	
70	1	N.MR.4		1	N.ME.8	1	N.ME.10	1	N.ME.10		1	N.ME.7	1	N.ME.7	1	N.ME.7	2	N.ME.7		1	N.ME.7		1	N.ME.7		2	N.ME.10	2	N.ME.7	
71	1	G.GS.2		1	G.GS.2	1	G.GS.2	2	G.GS.2		1	G.GS.2	1	G.GS.2	1	G.GS.2	2	G.GS.2		2	G.GS.2		1	G.GS.2		2	G.SR	2	G.GS.2	

Table 5.8
DOK Levels and Objectives Coded by Each Reviewer
Michigan Grade 5 Mathematics

72	2	G.RE.2		2	G.RE.2	2	G.RE.2	2	G.RE.2		2	G.RE.2	2	G.RE.3	2	G.RE.2	2	G.RE.2		2	G.RE.2		2	G.RE.2		2	G.RE.2	2	G.RE.2	
73	2	G.RE.2	G.RE.3	2	G.RE.2	2	G.RE.2	2	G.RE.2		2	G.RE.2	2	G.RE.2	2	G.RE.2	2	G.RE.2		2	G.RE.2		2	G.RE.2		2	G.RE.2	2	G.RE.3	
74	1	G.GS.1		1	G.GS.1	1	G.GS.1	1	G.GS.1		1	G.GS.1	1	G.GS.1	1	G.GS.1	1	G.GS.1		1	G.GS.1		1	G.GS.1		2	G.GS.2	1	G.GS.1	
75	1	G.TR.1		2	G.TR.1	2	G.TR.1	2	G.TR.1		1	G.TR.1	1	G.TR.1	1	G.TR.1	1	G.TR.1		1	G.TR.1		1	G.TR.1		1	G.TR.1	2	G.TR.1	
76																														
77																														
78	1	M.TE.2		1	M.TE.2	2	M.TE.2	2	M.TE.2		2	M.TE.2	1	M.TE.2	1	M.TE.2	1	M.TE.2		1	M.TE.2		1	M.TE.2		1	M.TE.2	1	M.TE.2	
79	2	G.RE.3	G.RE.1	2	G.RE.1			3	G.RE.1		2	G.RE.1	3	G.RE.2	2	G.RE.3	4	G.RE.1	G.RE.3	2	G.RE.3	G.RE.2	2	G.RE.2	G.RE.3	3	G.RE.1	4	G.RE.1	G.RE.3

Pairwise Comparison: 0.5946
Standard Pairwise Comparison: 0.9432

Table 5.9
Objectives Coded to Each Item by Reviewers
Michigan Grade 5 Mathematics

Low		Medium		High
0		10.6962		16

1	N.ME.1	N.ME.1	N.ME.1	N.ME.1	N.ME.1	N.ME.1	N.ME.1	N.ME.1	N.ME.1	N.ME.1
	N.ME.1	N.ME.2								
2	N.ME.7	N.ME.7	N.MR	N.MR.15	N.MR.15	N.MR.15	G.RE.3	G.RE.3	G.RE.3	G.RE.3
	G.RE.3	G.RE.3	G.RE.3							
3	N.MR.15	N.MR.15	N.MR.15	N.MR.15	N.MR.15	N.MR.15	N.MR.15	N.MR.15	N.MR.15	N.MR.15
	N.FL.1	N.FL.1								
4	N.MR	N.MR	N.MR.2	N.MR.15	N.MR.15	N.FL	N.FL.5	N.FL.5	N.FL.5	N.FL.5
5	N.MR	N.MR.2	N.MR.2	N.MR.2	N.MR.2	N.MR.2	N.MR.2	N.MR.2	N.MR.2	N.FL.5
	N.FL.5	G.GS.2								
6	N.ME.4	N.ME.4	N.ME.4	N.MR.1	N.MR.1	N.MR.1	N.MR.1	N.MR.2	N.MR.2	N.MR.15
	N.FL.5	N.FL.5								
7	N.ME.4	N.ME.4	N.ME.4	N.MR.2	N.MR.2	N.FL.2	N.FL.2	N.FL.2	N.FL.2	N.FL.2
	N.FL.2	N.FL.5								
8	N.ME.6	N.ME.6	N.ME.6	N.ME.6	N.ME.6	N.ME.6	N.ME.6	N.ME.6	N.ME.6	N.ME.6
	N.FL	N.FL.2								
9	N.ME.6	N.ME.6	N.ME.6	N.ME.6	N.ME.6	N.ME.6	N.ME.6	N.ME.6	N.ME.6	N.ME.6
	N.FL	N.FL.2								
10	N.ME.6	N.ME.6	N.ME.6	N.ME.6	N.ME.6	N.ME.6	N.ME.6	N.ME.6	N.ME.6	N.ME.6
	N.FL.2	N.FL.2								

Table 5.9
Objectives Coded to Each Item by Reviewers
Michigan Grade 5 Mathematics

11	N.M E.5	N.M E.5	N.M E.5	N.M E.5	N.M E.5	N.M E.5	N.M E.5	N.M E.5	N.M E.5	N.M R.2
	N.M R.2	N.M R.2								
12	N.M E.4	N.M E.4	N.M R.2	N.M R.2	N.M R.2	N.M R.2	N.M R.2	N.M R.2	N.M R.2	N.M R.2
	N.F L.2	N.F L.5								
13	N.M E.4	N.M E.4	N.M R.1	N.M R.1	N.M R.1	N.M R.1	N.M R.1	N.M R.1	N.M R.2	N.M R.2
	N.M R.2	N.M R.2								
14										
15										
16	N.M R.3	N.M R.3	N.M R.3	N.M R.3	N.M R.6	N.F L.4	N.F L.4	N.F L.4	N.F L.4	N.F L.4
	N.F L.4	N.F L.4								
17	N.M E.4	N.M E.4	N.M E.4	N.M E.4	N.M E.4	N.M E.5	N.M R	N.M R.2	N.M R.2	N.M R.2
	N.M R.2	N.F L.5								
18	N.F L.2	N.F L.3	N.F L.3	N.F L.3	N.F L.3	N.F L.3	N.F L.3	N.F L.3	N.F L.3	N.F L.3
	N.F L.5	N.F L.5								
19	N.F L.3	N.F L.3	N.F L.3	N.F L.5	N.F L.5	N.F L.5	N.F L.5	N.F L.5	N.F L.5	N.F L.5
	N.F L.5	N.F L.5								
20	N.M R.12	N.M R.12	N.M R.12	N.M R.12	N.M R.12	N.M R.12	N.M R.12	N.M R.12	N.M R.12	N.M R.12
	N.M R.12	N.M R.12								
21	N.M R	N.M R.15	N.M R.15	N.M R.15	N.M R.15	N.M R.15	N.M R.15	N.M R.15	N.M R.15	N.M R.15
	N.M R.15	N.F L								
22	N.M E.5	N.M E.5	N.M E.5	N.M E.5	N.M E.5	N.M E.5	N.M E.5	N.M E.5	N.M E.5	N.M E.5
	N.M E.5	N.M R.2								
23	N.M	N.M	N.M	N.M	N.M	N.M	N.M	N.M	N.M	N.M

Table 5.9
Objectives Coded to Each Item by Reviewers
Michigan Grade 5 Mathematics

	E.7	R	R.3	R.8	R.15	R.15	R.15	R.15	R.15	R.15
	N.F L.8	N.F L.8	N.F L.8							
24	M.U N	M.U N.2	M.U N.2	M.U N.2	M.U N.2	M.U N.2	M.U N.2	M.U N.2	M.U N.2	M.U N.2
	M.U N.2	M.U N.2								
25	M.U N.1	M.U N.1	M.U N.1	M.U N.1	M.U N.1	M.U N.1	M.U N.1	M.U N.1	M.U N.1	M.U N.3
	M.U N.3	M.U N.3								
26	N.M E.7	N.M E.8	N.M E.8	N.M E.8	N.M E.8	N.M E.8	N.M E.8	N.M E.8	N.M E.8	N.M E.8
	N.M R.4	N.M R.4								
27	N.M E.7	N.M E.7	N.M E.7	N.M E.7	N.M E.7	N.M E.7	N.M E.7	N.M E.7	N.M E.7	N.M E.7
	N.M E.7	N.M E.7								
28	G.T R.1	G.T R.2	G.T R.2	G.T R.2	G.T R.2	G.T R.2	G.T R.2	G.T R.2	G.T R.2	G.T R.2
	G.T R.2	G.T R.2								
29	N.M R	N.M R.2	N.M R.2	G.R E.3	G.R E.3	G.R E.3	G.R E.3	G.R E.3	G.R E.3	G.R E.3
	G.R E.3	G.R E.3								
30	M.U N.1	M.U N.1	M.U N.1	M.U N.1	M.U N.1	M.U N.1	M.U N.1	M.U N.1	M.U N.1	M.U N.1
	M.U N.1	M.U N.2								
31	M.U N.4	M.U N.4	M.U N.4	M.U N.4	M.U N.4	M.U N.4	M.U N.4	M.U N.4	M.T E.3	M.T E.3
	M.T E.3	M.T E.4								
32	N.M E.7	N.M E.7	N.M E.7	N.M E.7	N.M E.8	N.M E.8	N.M E.8	N.M E.8	N.M E.8	N.M E.8
	N.M E.8	N.M E.8								
33	M.U N.5	G.S R.1	G.S R.1	G.S R.1	G.S R.1	G.S R.1	G.S R.1	G.S R.1	G.S R.1	G.S R.1
	G.S R.1	G.S R.1								

Table 5.9
Objectives Coded to Each Item by Reviewers
Michigan Grade 5 Mathematics

34	N.M R.6	N.M R.6	N.M R.6	N.M R.6	N.M R.6	N.M R.6	N.M R.6	N.M R.6	N.M R.6	N.M R.6
	N.M R.6	N.M R.8								
35	G.T R.2	G.T R.2	G.T R.2	G.T R.2	G.T R.2	G.T R.2	G.T R.2	G.T R.2	G.T R.2	G.T R.2
	G.T R.2	G.T R.2								
36	M.U N.1	M.U N.1	M.U N.1	M.U N.1	M.U N.1	M.U N.1	M.U N.1	M.U N.1	M.U N.1	M.U N.1
	M.U N.1	M.U N.1								
37										
38										
39										
40	N.M E.7	N.M E.7	N.M E.8	N.M E.8	N.M E.8	N.M E.8	N.M E.8	N.M E.10	N.M E.10	N.M E.10
	N.M E.10	N.M R.4								
41	M.U N	M.U N.1	M.U N.1	M.U N.1	M.U N.1	M.U N.1	M.U N.1	M.U N.1	M.U N.1	M.U N.1
	M.U N.1	M.U N.1								
42	N.M R.15	M.U N.4	M.U N.4	M.U N.4	M.U N.4	M.U N.4	M.U N.4	M.U N.5	M.T E.3	M.T E.3
	M.T E.3	M.T E.3								
43	N.M R.5	N.M R.5	N.M R.5	N.M R.5	N.M R.5	N.M R.5	N.M R.5	N.M R.7	N.M R.7	N.M R.7
	N.M R.10	N.M R.11								
44	G.R E.3	G.R E.3	G.R E.3	G.R E.3	G.R E.3	G.R E.3	G.R E.3	G.R E.3	G.R E.3	G.R E.3
	G.R E.3	G.R E.3								
45	M.U N.4	G	G.G S.2	G.G S.2	G.G S.2	G.G S.2	G.S R	G.S R	G.S R	G.S R
	G.S R.1	G.S R.1								
46	M.U N.4	M.U N.4	M.U N.4	M.U N.4	M.U N.4	M.U N.4	M.U N.5	M.T E.3	M.T E.3	M.T E.3
	M.T E.3	M.T E.4								

Table 5.9
Objectives Coded to Each Item by Reviewers
Michigan Grade 5 Mathematics

47	M.UN.2	M.UN.2	M.UN.2	M.UN.2	M.UN.2	M.UN.2	M.UN.2	M.UN.2	M.UN.2	M.UN.2
	M.UN.3	M.UN.3								
48	M.UN	M.UN.1	M.UN.1	M.UN.1	M.UN.2	M.UN.2	M.UN.3	M.UN.3	M.UN.3	M.UN.3
	M.UN.3	M.UN.3								
49	M.UN.4	M.UN.4	M.UN.4	M.UN.4	M.UN.4	M.UN.4	M.UN.4	M.TE.3	M.TE.3	M.TE.3
	M.TE.3	M.TE.3								
50	N.MR	N.MR.14	N.MR.15	N.MR.15	N.MR.15	G.RE.3	G.RE.3	G.RE.3	G.RE.3	G.RE.3
	G.RE.3	G.RE.3								
51	M.UN.1	M.UN.1	M.UN.1	M.UN.2	M.UN.2	M.UN.2	M.UN.2	M.UN.2	M.UN.2	M.UN.2
	M.UN.2	M.UN.2								
52	M.UN.5	M.TE.4	M.TE.4	M.TE.4	M.TE.4	M.TE.4	M.TE.4	M.TE.4	M.TE.4	M.TE.4
	M.TE.4	M.TE.5								
53	G.GS.1	G.GS.1	G.GS.1	G.SR.1	G.SR.1	G.SR.1	G.SR.1	G.SR.1	G.SR.1	G.SR.1
	G.SR.1	G.TR								
54	N.MR.6	N.MR.7	N.MR.15	N.MR.15	N.MR.15	N.MR.15	N.FL.11	N.FL.11	N.FL.11	N.FL.11
	M.UN.3	M.UN.3								
55	G.GS.1	G.GS.2	G.SR	G.SR.1	G.SR.1	G.SR.1	G.SR.1	G.SR.1	G.SR.1	G.SR.1
	G.SR.1	G.SR.1								
56	N.MR.15	N.MR.15	G.RE.3	G.RE.3	G.RE.3	G.RE.3	G.RE.3	G.RE.3	G.RE.3	G.RE.3
	G.RE.3	G.RE.3								
57	G.GS.2	G.GS.2	G.GS.2	G.GS.2	G.GS.2	G.GS.2	G.GS.2	G.GS.2	G.GS.2	G.GS.2
	G.G	G.G								

Table 5.9
Objectives Coded to Each Item by Reviewers
Michigan Grade 5 Mathematics

	S.2	S.2								
58	M.UN.4	M.UN.5	M.TE.4	M.TE.4	M.TE.4	M.TE.4	M.TE.4	M.TE.4	M.TE.4	M.TE.4
	M.TE.4	M.TE.5								
59	N.MR.14	N.MR.14	N.MR.14	N.MR.15	N.MR.15	N.FL	N.FL.7	N.FL.7	N.FL.11	M.UN.3
	M.UN.3	M.UN.3								
60										
61										
62	N.ME.7	N.ME.7	N.ME.7	N.ME.7	N.ME.7	N.ME.8	N.ME.10	N.ME.10	N.MR.4	N.MR.4
	N.MR.4	N.MR.4								
63	M.TE.6	G.GS.2	G.GS.2	G.GS.2	G.GS.2	G.GS.2	G.GS.2	G.GS.2	G.GS.2	G.GS.2
	G.GS.2	G.GS.2								
64	G.RE	G.RE.1	G.RE.1	G.RE.1	G.RE.1	G.RE.1	G.RE.1	G.RE.1	G.RE.1	G.RE.1
	G.RE.1	G.RE.2								
65	N.FL.11	M.UN.1	M.UN.1	M.UN.1	M.UN.1	M.UN.1	M.UN.1	M.UN.1	M.UN.1	M.UN.1
	M.UN.2	M.UN.3								
66	M.TE.2	M.TE.2	M.TE.2	M.TE.2	M.TE.2	M.TE.2	M.TE.2	M.TE.2	M.TE.2	M.TE.2
	M.TE.2	M.TE.2								
67	N.ME.7	N.ME.7	N.ME.8	N.ME.8	N.ME.8	N.ME.10	N.ME.10	N.ME.10	N.MR.4	N.MR.4
	N.MR.4	N.MR.15								
68	N.MR.6	N.MR.6	N.MR.6	N.MR.6	N.MR.6	N.MR.6	N.MR.6	N.MR.6	N.MR.6	N.MR.6
	N.MR.7	N.MR.8								
69	G.RE.2	G.RE.2	G.RE.2	G.RE.2	G.RE.2	G.RE.2	G.RE.2	G.RE.2	G.RE.2	G.RE.2
	G.RE.2	G.RE.3								

Table 5.9
Objectives Coded to Each Item by Reviewers
Michigan Grade 5 Mathematics

70	N.M E.7	N.M E.7	N.M E.7	N.M E.7	N.M E.7	N.M E.7	N.M E.7	N.M E.8	N.M E.10	N.M E.10
	N.M E.10	N.M R.4								
71	G.G S.2	G.G S.2	G.G S.2	G.G S.2	G.G S.2	G.G S.2	G.G S.2	G.G S.2	G.G S.2	G.G S.2
	G.G S.2	G.S R								
72	G.R E.2	G.R E.2	G.R E.2	G.R E.2	G.R E.2	G.R E.2	G.R E.2	G.R E.2	G.R E.2	G.R E.2
	G.R E.2	G.R E.3								
73	G.R E.2	G.R E.2	G.R E.2	G.R E.2	G.R E.2	G.R E.2	G.R E.2	G.R E.2	G.R E.2	G.R E.2
	G.R E.2	G.R E.3	G.R E.3							
74	G.G S.1	G.G S.1	G.G S.1	G.G S.1	G.G S.1	G.G S.1	G.G S.1	G.G S.1	G.G S.1	G.G S.1
	G.G S.1	G.G S.2								
75	G.T R.1	G.T R.1	G.T R.1	G.T R.1	G.T R.1	G.T R.1	G.T R.1	G.T R.1	G.T R.1	G.T R.1
	G.T R.1	G.T R.1								
76										
77										
78	M.T E.2	M.T E.2	M.T E.2	M.T E.2	M.T E.2	M.T E.2	M.T E.2	M.T E.2	M.T E.2	M.T E.2
	M.T E.2	M.T E.2								
79	G.R E.1	G.R E.1	G.R E.1	G.R E.1	G.R E.1	G.R E.1	G.R E.1	G.R E.2	G.R E.2	G.R E.2
	G.R E.3	G.R E.3	G.R E.3	G.R E.3	G.R E.3	G.R E.3				

Table 5.10
Items Coded by Reviewers to Each Objective
Michigan Grade 5 Mathematics

Low		Medium		High
0		12.07143		58

N																				
N.ME																				
N.ME.1	1	1	1	1	1	1	1	1	1	1	1									
N.ME.2	1																			
N.ME.3																				
N.ME.4	6	6	6	7	7	7	12	12	13	13	17	17	17	17	17					
N.ME.5	11	11	11	11	11	11	11	11	11	17	22	22	22	22	22	22	22	22	22	22
	22																			
N.ME.6	8	8	8	8	8	8	8	8	8	8	9	9	9	9	9	9	9	9	9	9
	10	10	10	10	10	10	10	10	10	10										
N.ME.7	2	2	23	26	27	27	27	27	27	27	27	27	27	27	27	27	32	32	32	32
	40	40	62	62	62	62	62	67	67	70	70	70	70	70	70	70				
N.ME.8	26	26	26	26	26	26	26	26	26	32	32	32	32	32	32	32	32	40	40	40
	40	40	62	67	67	67	70													
N.ME.9																				
N.ME.10	40	40	40	40	62	62	67	67	67	70	70	70								
N.ME.11																				
N.MR	2	4	4	5	17	21	23	29	50											
N.MR.1	6	6	6	6	13	13	13	13	13	13										
N.MR.2	4	5	5	5	5	5	5	5	5	6	6	7	7	11	11	11	12	12	12	12
	12	12	12	12	13	13	13	13	17	17	17	17	22	29	29					
N.MR.3	16	16	16	16	23															
N.M	26	26	40	62	62	62	62	67	67	67	70									

Table 5.10
Items Coded by Reviewers to Each Objective
Michigan Grade 5 Mathematics

R.4																				
N.M R.5	43	43	43	43	43	43	43													
N.M R.6	16	34	34	34	34	34	34	34	34	34	34	34	54	68	68	68	68	68	68	68
	68	68	68																	
N.M R.7	43	43	43	54	68															
N.M R.8	23	34	68																	
N.M R.9																				
N.M R.10	43																			
N.M R.11	43																			
N.M R.12	20	20	20	20	20	20	20	20	20	20	20	20								
N.M R.13																				
N.M R.14	50	59	59	59																
N.M R.15	2	2	2	3	3	3	3	3	3	3	3	3	3	4	4	6	21	21	21	21
	21	21	21	21	21	21	23	23	23	23	23	23	42	50	50	50	54	54	54	
	54	56	56	59	59	67														
N.F L	4	8	9	21	59															
N.F L.1	3	3																		
N.F L.2	7	7	7	7	7	7	8	9	10	10	12	18								
N.F L.3	18	18	18	18	18	18	18	18	18	19	19	19								
N.F L.4	16	16	16	16	16	16	16													
N.F L.5	4	4	4	4	5	5	6	6	7	12	17	18	18	19	19	19	19	19	19	19
	19	19																		
N.F L.6																				
N.F L.7	59	59																		

Table 5.10
Items Coded by Reviewers to Each Objective
Michigan Grade 5 Mathematics

N.FL.8	23	23	23																	
N.FL.9																				
N.FL.10																				
N.FL.11	54	54	54	54	59	65														
M																				
M.UN	24	41	48																	
M.UN.1	25	25	25	25	25	25	25	25	25	30	30	30	30	30	30	30	30	30	30	30
	36	36	36	36	36	36	36	36	36	36	36	36	41	41	41	41	41	41	41	
	41	41	41	41	48	48	48	51	51	51	65	65	65	65	65	65	65	65	65	
M.UN.2	24	24	24	24	24	24	24	24	24	24	24	30	47	47	47	47	47	47	47	47
	47	47	48	48	51	51	51	51	51	51	51	51	51	65						
M.UN.3	25	25	25	47	47	48	48	48	48	48	48	54	54	59	59	59	65			
M.UN.4	31	31	31	31	31	31	31	31	42	42	42	42	42	42	45	46	46	46	46	46
	46	49	49	49	49	49	49	49	58											
M.UN.5	33	42	46	52	58															
M.TE																				
M.TE.1																				
M.TE.2	66	66	66	66	66	66	66	66	66	66	66	66	78	78	78	78	78	78	78	78
	78	78	78	78																
M.TE.3	31	31	31	42	42	42	42	46	46	46	46	49	49	49	49	49				
M.TE.4	31	46	52	52	52	52	52	52	52	52	52	52	58	58	58	58	58	58	58	58
	58																			
M.TE.5	52	58																		
M.TE.6	63																			
G	45																			

Table 5.10
Items Coded by Reviewers to Each Objective
Michigan Grade 5 Mathematics

G.GS																				
G.GS.1	53	53	53	55	74	74	74	74	74	74	74	74	74	74	74					
G.GS.2	5	45	45	45	45	55	57	57	57	57	57	57	57	57	57	57	57	57	63	63
	63	63	63	63	63	63	63	63	63	71	71	71	71	71	71	71	71	71	71	
	71	74																		
G.SR	45	45	45	45	55	71														
G.SR.1	33	33	33	33	33	33	33	33	33	33	33	45	45	53	53	53	53	53	53	53
	53	55	55	55	55	55	55	55	55	55										
G.TR	53																			
G.TR.1	28	75	75	75	75	75	75	75	75	75	75	75	75							
G.TR.2	28	28	28	28	28	28	28	28	28	28	28	35	35	35	35	35	35	35	35	35
	35	35	35																	
D																				
G.RE	64																			
G.RE.1	64	64	64	64	64	64	64	64	64	64	79	79	79	79	79	79	79			
G.RE.2	64	69	69	69	69	69	69	69	69	69	69	69	72	72	72	72	72	72	72	72
	72	72	72	73	73	73	73	73	73	73	73	73	73	73	79	79	79			
G.RE.3	2	2	2	2	2	2	2	29	29	29	29	29	29	29	29	29	44	44	44	44
	44	44	44	44	44	44	44	44	50	50	50	50	50	50	50	56	56	56	56	
	56	56	56	56	56	56	69	72	73	73	79	79	79	79	79	79				

Table 5.11
Number of Reviewers Coding an Item by Objective (Item Number: Number of Reviewers)
Michigan Grade 5 Mathematics

Low		Medium		High
1		6		12

N									
N.ME									
N.ME.1	1:11								
N.ME.2	1:1								
N.ME.3									
N.ME.4	6:3	7:3	12:2	13:2	17:5				
N.ME.5	11:9	17:1	22:11						
N.ME.6	8:10	9:10	10:10						
N.ME.7	2:2	23:1	26:1	27:12	32:4	40:2	62:5	67:2	70:7
N.ME.8	26:9	32:8	40:5	62:1	67:3	70:1			
N.ME.9									
N.ME.10	40:4	62:2	67:3	70:3					
N.ME.11									
N.MR	2:1	4:2	5:1	17:1	21:1	23:1	29:1	50:1	
N.MR.1	6:4	13:6							
N.MR.2	4:1	5:8	6:2	7:2	11:3	12:8	13:4	17:4	22:1	29:2
N.MR.3	16:4	23:1							
N.MR.4	26:2	40:1	62:4	67:3	70:1				
N.MR.5	43:7								
N.MR.6	16:1	34:11	54:1	68:10					

Table 5.11
Number of Reviewers Coding an Item by Objective (Item Number: Number of Reviewers)
Michigan Grade 5 Mathematics

N.MR.7	43:3	54:1	68:1									
N.MR.8	23:1	34:1	68:1									
N.MR.9												
N.MR.10	43:1											
N.MR.11	43:1											
N.MR.12	20:12											
N.MR.13												
N.MR.14	50:1	59:3										
N.MR.15	2:3	3:10	4:2	6:1	21:10	23:6	42:1	50:3	54:4	56:2	59:2	67:1
N.FL	4:1	8:1	9:1	21:1	59:1							
N.FL.1	3:2											
N.FL.2	7:6	8:1	9:1	10:2	12:1	18:1						
N.FL.3	18:9	19:3										
N.FL.4	16:7											
N.FL.5	4:4	5:2	6:2	7:1	12:1	17:1	18:2	19:9				
N.FL.6												
N.FL.7	59:2											
N.FL.8	23:3											
N.FL.9												
N.FL.10												
N.FL.11	54:4	59:1	65:1									
M												

Table 5.11
Number of Reviewers Coding an Item by Objective (Item Number: Number of Reviewers)
Michigan Grade 5 Mathematics

M.UN	24:1	41:1	48:1				
M.UN.1	25:9	30:11	36:12	41:11	48:3	51:3	65:9
M.UN.2	24:11	30:1	47:10	48:2	51:9	65:1	
M.UN.3	25:3	47:2	48:6	54:2	59:3	65:1	
M.UN.4	31:8	42:6	45:1	46:6	49:7	58:1	
M.UN.5	33:1	42:1	46:1	52:1	58:1		
M.TE							
M.TE.1							
M.TE.2	66:12	78:12					
M.TE.3	31:3	42:4	46:4	49:5			
M.TE.4	31:1	46:1	52:10	58:9			
M.TE.5	52:1	58:1					
M.TE.6	63:1						
G	45:1						
G.GS							
G.GS.1	53:3	55:1	74:11				
G.GS.2	5:1	45:4	55:1	57:12	63:11	71:11	74:1
G.SR	45:4	55:1	71:1				
G.SR.1	33:11	45:2	53:8	55:9			
G.TR	53:1						
G.TR.1	28:1	75:12					
G.TR.2	28:11	35:12					

Table 5.11
Number of Reviewers Coding an Item by Objective (Item Number: Number of Reviewers)
Michigan Grade 5 Mathematics

D									
G.RE	64:1								
G.RE.1	64:10	79:7							
G.RE.2	64:1	69:11	72:11	73:11	79:3				
G.RE.3	2:7	29:9	44:12	50:7	56:10	69:1	72:1	73:2	79:6

Table 5.13
Assessment Item DOK vs Consensus DOK (Item Number: Number of Reviewers [Average DOK])
Michigan Grade 5 Mathematics

Low DOK		Matched DOK		High DOK
1		6		12

N [2]:									
N.ME [1]:									
N.ME.1 [1]:	1:11 [1]								
N.ME.2 [1]:	1:1[1]								
N.ME.3 [1]:									
N.ME.4 [2]:	6:3[2]	7:3[1]	12:2 [1.5]	13:2 [1]	17:5 [2.2]				
N.ME.5 [2]:	11:9 [1]	17:1 [3]	22:11[1]						
N.ME.6 [2]:	8:10 [1.8]	9:10 [1.9]	10:10[1.9]						
N.ME.7 [1]:	2:2[1]	23:1 [2]	26:1 [1]	27:12[1.25]	32:4 [1]	40:2 [1]	62:5 [1.4]	67:2 [2]	70:7 [1.29]
N.ME.8 [1]:	26:9 [1.11]	32:8 [1]	40:5 [1]	62:1 [1]	67:3 [1]	70:1 [1]			
N.ME.9 [1]:									
N.ME.10 [2]:	40:4 [1.5]	62:2 [1]	67:3 [2]	70:3 [1.33]					
N.ME.11 [1]:									

Table 5.13
Assessment Item DOK vs Consensus DOK (Item Number: Number of Reviewers [Average DOK])
Michigan Grade 5 Mathematics

N.MR [2]:	2:1[2]	4:2[1.5]	5:1[2]	17:1 [2]	21:1 [2]	23:1 [1]	29:1 [2]	50:1 [1]		
N.MR.1 [1]:	6:4[1.5]	13:6 [1]								
N.MR.2 [2]:	4:1[1]	5:8[1.75]	6:2[1.5]	7:2[1]	11:3 [1]	12:8 [1.25]	13:4 [1]	17:4 [2]	22:1 [1]	29:2 [2]
N.MR.3 [1]:	16:4 [1]	23:1 [2]								
N.MR.4 [1]:	26:2 [1]	40:1 [1]	62:4 [1]	67:3 [1.33]	70:1 [1]					
N.MR.5 [2]:	43:7 [1.57]									
N.MR.6 [2]:	16:1 [2]	34:11[1.36]	54:1 [1]	68:10[1.1]						
N.MR.7 [1]:	43:3 [1.67]	54:1 [2]	68:1 [2]							
N.MR.8 [1]:	23:1 [1]	34:1 [1]	68:1 [1]							
N.MR.9 [1]:										
N.MR.10 [2]:	43:1[2]									
N.MR.11 [2]:	43:1[2]									
N.MR.12 [2]:	20:12[1.58]									
N.MR.13 [2]:										
N.M	50:1	59:3								

Table 5.13
Assessment Item DOK vs Consensus DOK (Item Number: Number of Reviewers [Average DOK])
Michigan Grade 5 Mathematics

R.14 [2]:	[2]	[2]										
N.MR.15 [2]:	2:3[2]	3:10 [2]	4:2[2]	6:1[1]	21:10[1.9]	23:6 [1.5]	42:1 [2]	50:3 [1.67]	54:4 [2.25]	56:2 [1.5]	59:2 [2]	67:1 [2]
N.FL [2]:	4:1[1]	8:1[1]	9:1[1]	21:1 [2]	59:1 [2]							
N.FL.1 [1]:	3:2[2]											
N.FL.2 [2]:	7:6[1]	8:1[2]	9:1[2]	10:2 [1.5]	12:1 [1]	18:1 [1]						
N.FL.3 [1]:	18:9 [1.22]	19:3 [1.33]										
N.FL.4 [2]:	16:7 [1.57]											
N.FL.5 [2]:	4:4[2.25]	5:2[2]	6:2[1.5]	7:1[1]	12:1 [1]	17:1 [2]	18:2 [1]	19:9 [1.44]				
N.FL.6 [2]:												
N.FL.7 [1]:	59:2 [1]											
N.FL.8 [1]:	23:3 [1.33]											
N.FL.9 [2]:												
N.FL.10 [2]:												
N.FL.11 [2]:	54:4 [1.75]	59:1 [1]	65:1 [1]									
M [2]:												

Table 5.13
Assessment Item DOK vs Consensus DOK (Item Number: Number of Reviewers [Average DOK])
Michigan Grade 5 Mathematics

M.UN [2]:	24:1 [1]	41:1 [1]	48:1 [1]				
M.UN.1 [1]:	25:9 [1.11]	30:11[1]	36:12[1.17]	41:11[1]	48:3 [1.67]	51:3 [1.33]	65:9 [1.33]
M.UN.2 [1]:	24:11[1.18]	30:1 [1]	47:10[1]	48:2 [1]	51:9 [1.11]	65:1 [1]	
M.UN.3 [2]:	25:3 [1.67]	47:2 [1]	48:6 [1.5]	54:2 [3]	59:3 [1.33]	65:1 [1]	
M.UN.4 [2]:	31:8 [2]	42:6 [2.5]	45:1 [1]	46:6 [1.5]	49:7 [1.43]	58:1 [1]	
M.UN.5 [2]:	33:1 [2]	42:1 [2]	46:1 [2]	52:1 [2]	58:1 [2]		
M.TE [2]:							
M.TE.1 [2]:							
M.TE.2 [1]:	66:12[2]	78:12[1.25]					
M.TE.3 [2]:	31:3 [2]	42:4 [2]	46:4 [1.75]	49:5 [1.2]			
M.TE.4 [2]:	31:1 [2]	46:1 [2]	52:10[1.8]	58:9 [1.78]			
M.TE.5 [1]:	52:1 [1]	58:1 [2]					
M.TE.6 [1]:	63:1 [1]						
G [1]:	45:1 [2]						
G.GS							

Table 5.13
Assessment Item DOK vs Consensus DOK (Item Number: Number of Reviewers [Average DOK])
Michigan Grade 5 Mathematics

[2]:									
G.GS.1 [1]:	53:3 [1]	55:1 [1]	74:11[1]						
G.GS.2 [2]:	5:1[2]	45:4 [2]	55:1 [1]	57:12[1.42]	63:11[1.91]	71:11[1.36]	74:1 [2]		
G.SR [1]:	45:4 [2]	55:1 [1]	71:1 [2]						
G.SR.1 [1]:	33:11[1.45]	45:2 [2]	53:8 [1.25]	55:9 [1.56]					
G.TR [1]:	53:1 [2]								
G.TR.1 [1]:	28:1 [1]	75:12[1.33]							
G.TR.2 [1]:	28:11[1.36]	35:12[1.17]							
D [2]:									
G.RE [2]:	64:1 [2]								
G.RE.1 [2]:	64:10[2.6]	79:7 [2.86]							
G.RE.2 [2]:	64:1 [2]	69:11[2]	72:11[2]	73:11[2]	79:3 [2.33]				
G.RE.3 [2]:	2:7[1.86]	29:9 [1.89]	44:12[1.42]	50:7 [1.86]	56:10[2.2]	69:1 [1]	72:1 [2]	73:2 [2]	79:6 [2.67]

Table 6.1
Categorical Concurrence Between Standards and Assessment as Rated by Seven Reviewers
Michigan Grade 6 Mathematics
Number of Assessment Items - 69

Standards			Level by Objective			Hits		Cat. Concurr.
Title	Goals #	Objs #	Level	# of objs by Level	% w/in std by Level	Mean	S.D.	
N - Number & Operations	3	24	1 2	13 9	59 40	40.43	1.50	YES
M - Measurement	3	8.43	1 2	4 4	50 50	11.86	0.64	YES
G - Geometry	2	7.29	1 2	4 3	57 42	9.29	0.70	YES
D - Data & Probability	2	5.14	2	4	100	8.14	1.25	YES
Total	10	44.86	1 2	21 20	51 48	69.71	1.48	

Table 6.2
Depth-of-Knowledge Consistency Between Standards and Assessment as Rated by Seven Reviewers
Michigan Grade 6 Mathematics
Number of Assessment Items - 69

Standards			Hits		Level of Item w.r.t. Standard						DOK Consistency
					% Under		% At		% Above		
Title	Goals #	Objs #	M	S.D.	M	S.D.	M	S.D.	M	S.D.	
N - Number & Operations	3	24	40.43	1.50	17	34	60	41	23	36	YES
M - Measurement	3	8.43	11.86	0.64	30	37	51	37	19	33	YES
G - Geometry	2	7.29	9.29	0.70	22	39	68	42	10	27	YES
D - Data & Probability	2	5.14	8.14	1.25	26	38	68	41	6	25	YES
Total	10	44.86	69.71	1.48	21	36	61	41	18	33	

Table 6.3
Range-of-Knowledge Correspondence and Balance of Representation Between Standards and Assessment as Rated by Seven Reviewers
Michigan Grade 6 Mathematics
Number of Assessment Items - 69

Standards			Hits		Range of Objectives				Rng. of Know.	Balance Index				Bal. of Represent.
					# Objs Hit		% of Total			% Hits in Std/Ttl Hits		Index		
Title	Goals #	Objs #	Mean	S.D.	Mean	S.D.	Mean	S.D.		Mean	S.D.	Mean	S.D.	
N - Number & Operations	3	24	40.43	1.50	14.86	2.10	62	9	YES	58	2	0.70	0.06	YES
M - Measurement	3	8.43	11.86	0.64	4.71	0.70	56	6	YES	17	1	0.81	0.09	YES
G - Geometry	2	7.29	9.29	0.70	4.29	1.16	59	14	YES	13	1	0.88	0.08	YES
D - Data & Probability	2	5.14	8.14	1.25	4.43	0.90	86	9	YES	12	2	0.81	0.04	YES
Total	10	44.86	69.71	1.48	7.07	4.69	66	15		25	19	0.80	0.09	

Table 6.4
Summary of Attainment of Acceptable Alignment Level on Four Content Focus Criteria as Rated by Seven Reviewers
Michigan Grade 6 Mathematics
Number of Assessment Items - 69

Standards	Alignment Criteria			
	Categorical Concurrence	Depth-of-Knowledge Consistency	Range of Knowledge	Balance of Representation
N - Number & Operations	YES	YES	YES	YES
M - Measurement	YES	YES	YES	YES
G - Geometry	YES	YES	YES	YES
D - Data & Probability	YES	YES	YES	YES

Table 6.5
Source-of-Challenge Issues by Reviewer
Michigan Grade 6 Mathematics

Item Number	Comments by Reviewer
5	I challenge the phrase "on average" Meaning?
6	Same challenge as last item
16	Although I found other GLCEs that seemed to "fit" this problem, I chose N.FL.6 as it is an applied problem and "compares" fractions
21	The best way to write the number of items is 0. The problem might be better worded to ask which expression best represents the situation.
23	I think the student could think there are two possible answers. They might consider answer D even though they don't know how to find the area of that type of triangle.
30	The answers should be consistent. The additional information provided in answers B, C, and D raise potentially confusing issues for students. For example, if Tara is a child, why is she buying a trip?
54	There are no "greater than- less than" GLCEs
56	If the student does exactly what the question tells them there will be not enough ribbon for the pillow. If the student is clever they will go higher than the correct answer in order to make sure there is enough ribbon.
58	This problem is asking if students know that mean is the same is average. First, it's a trivial question. Second, the wording obscures what is being asked. The 'mean time' does not emphasize enough what 36.2 represents: it feels like it's just being slyly inserted. If the goal is to ask whether these represent the same thing, emphasize that 36.2 represents the mean of all the times for Chad's 200 meter runs.
58	Confusing phrase "mean time"; also no specific GLCE addresses this problem
63	No specific "number pattern" GLCE
64	I considered this problem a number line.
78	The GLCE calls for the student to construct a line graph but the directions to directly say that they must use a particular type of graph and I would hope students would not lose points due to using a different type of graph.

Table 6.6
Depth-of-Knowledge Levels by Item and Reviewers
Intraclass Correlation
Michigan Grade 6 Mathematics

Item	Rater 1	Rater 2	Rater 3	Rater 4	Rater 9	Rater 10	Rater 11
1	1	1	2	2	2	2	2
2	2	1	1	1	2	2	2
3	2	1	1	1	2	2	2
4	2	2	1	1	2	2	2
5	2	1	1	2	2	2	2
6	2	2	1	2	2	2	2
7	2	2	2	2	2	2	2
8	2	1	1	1	1	2	1
9	2	2	2	2	2	2	2
10	1	2	2	1	2	2	2
11	2	1	2	1	1	1	2
12	2	1	2	1	1	1	2
13	1	1	1	1	1	1	2
14							
15							
16	1	1	1	1	2	1	2
17	2	2	2	2	2	1	2
18	2	1	1	1	1	1	2
19	1	1	2	1	2	1	2
20	2	1	1	2	1	2	2
21	2	1	1	1	1	1	2
22	2	2	1	1	2	2	1
23	2	2	2	1	3	1	2
24	2	1	1	1	1	1	1
25	2	1	1	1	1	1	2
26	1	2	2	2	1	1	1
27	1	1	2	1	2	1	2
28	1	1	1	1	1	1	2
29	2	1	1	2	1	1	2
30	2	2	2	2	2	2	2
31	1	1	1	1	2	2	2
32	2	2	2	2	2	2	2
33	1	1	1	1	1	1	2
34	1	2	2	2	1	1	2
35	1	1	1	1	1	1	2
36	1	1	1	1	1	1	2
37							
38							
39							

Table 6.6
Depth-of-Knowledge Levels by Item and Reviewers
Intraclass Correlation
Michigan Grade 6 Mathematics

40	1	1	1	1	2	1	2
41	1	1	1	2	1	1	1
42	1	2	2	1	1	1	1
43	2	2	2	2	2	2	2
44	2	1	2	2	1	1	2
45	1	1	2	2	1	1	1
46	1	1	1	1	1	1	2
47	1	1	1	2	1	1	2
48	1	1	1	1	1	1	2
49	1	1	1	2	1	1	1
50	1	1	2	1	2	1	1
51	1	1	1	1	1	1	2
52	2	1	1	1	1	1	2
53	1	1	1	1	2	1	2
54	1	2	2	1	2	1	2
55	2	1	1	2	2	2	2
56	2	2	2	2	2	2	2
57	1	1	2	2	1	1	2
58	1	1	2	2	2	1	2
59	1	1	1	1	1	1	2
60							
61							
62	2	2	2	3	2	2	3
63	2	1	2	2	2	1	2
64	2	2	2	2	2	2	2
65	2	1	2	2	2	2	2
66	2	2	2	2	2	1	2
67	1	2	2	2	1	2	2
68	2	2	2	2	2	2	2
69	1	1	2	2	1	1	2
70	2	1	2	2	2	2	2
71	1	1	1	1	1	1	2
72	1	1	1	1	1	1	1
73	2	1	2	1	2	1	2
74	1	2	2	2	1	1	2
75	1	1	1	1	1	1	1
76							
77							
78	2	2	2	3	2	2	3

Table 6.6
Depth-of-Knowledge Levels by Item and Reviewers
Intraclass Correlation
Michigan Grade 6 Mathematics

Intraclass Correlation: 0.7714
Pairwise Comparison: 0.6135

Table 6.7
Notes by Reviewer
Michigan Grade 6 Mathematics

Item Number	Comments by Reviewer
1	Read remarks about this problem from grade 5 form.
6	This is a rate problem which is a subset of ratios. There is no standard for rates or ratios. I don't like lumping these under applied problems. Ratios and rates need special treatment when teaching.
7	Another rate problem-see note on 6.
16	This question did not align well with a GLCE.
17	There are no expectations that relate to finding patterns.
17	This question does not align with the 5th grade GLCE's well.
19	This GLCE specifies multiplying whole numbers by powers of 10 whereas the assessment question is multiplying a decimal by a power of ten.
20	Given that students are expected to be fluent at computation with numbers of this magnitude, it makes no sense to ask them to estimate this sum.
23	Students need to understand the derivation of the formula for parallelogram before they can derive the triangle formula.
40	Nothing specific mentioned to fit locating on a number line.
40	This question does not align well with the 5th grade GLCE's.
40	No number line
54	Did not find a GLCE that aligned with this question well.
56	This context is not realistic. Why would Kelsey measure to the nearest 16th and then round up or down for total. To get the right amount, she should round all measurements up anyway.
62	This is a trivial and unimaginative question.
63	This question does not align well with a specific 5th grade GLCE.

Table 6.8
DOK Levels and Objectives Coded by Each Reviewer
Michigan Grade 6 Mathematics

Item	DOK0	PObj0	S1Obj0	DOK1	PObj1	DOK2	PObj2	S1Obj2	DOK3	PObj3	S1Obj3	DOK8	PObj8	DOK9	PObj9	S1Obj9	DOK10	PObj10
1	1	N.FL.6		1	N.FL.6	2	N.FL.6		2	N.FL.6		2	N.MR.6	2	N.FL.6		2	N.FL.6
2	2	N.MR.4		1	N.MR.4	1	N.MR.4		1	N.MR.4		2	N.MR.4	2	N.FL.1		2	N.MR.4
3	2	N.MR.4		1	N.MR.4	1	N.MR.4		1	N.MR.4		2	N.FL.6	2	N.FL.1		2	N.MR.5
4	2	N.MR.4		2	N.MR.4	1	N.MR.4		1	N.MR.4		2	N.MR.4	2	N.FL.1		2	N.MR.4
5	2	N.MR.4		1	N.MR.4	1	N.MR.4	N.FL.2	2	N.MR.4		2	N.ME.5	2	N.FL.2		2	N.MR.4
6	2	N.MR.4		2	N.MR.4	1	N.MR.4	N.FL.2	2	N.MR.4		2	N.FL.6	2	N.MR.4		2	N.MR.4
7	2	N.FL.5		2	N.MR.4	2	N.MR.1		2	N.MR.1		2	N.FL.6	2	N.MR.4		2	N.MR.4
8	2	M.UN.4		1	M.UN.4	1	M.UN.4		1	M.UN.4		1	M.UN.4	2	M.UN.4		1	M.UN.2
9	2	M.UN.4		2	N.FL.6	2	M.UN.4		2	M.UN.4		2	N.ME.5	2	M.UN.4		2	M.PS
10	1	M.UN.4		2	M.UN.4	2	M.UN.4		1	M.UN		2	M.UN.1	2	M.UN.4		2	M.UN.4
11	2	N.ME.3		1	N.FL.6	2	N.MR.1		1	N.MR.1		1	N.MR.4	1	N.FL.3		2	N.MR
12	2	N.ME.3		1	N.MR.6	2	N.MR.6		1	N.MR.6		1	N.MR.6	1	N.MR.6		2	N.MR.7
13	1	N.ME.3		1	N.FL.4	1	N.FL.4		1	N.FL.4		1	N.FL.4	1	N.FL.4		2	N.FL.4
14																		
15																		
16	1	N.ME		1	N.ME	1	N.MR		1	N.MR		2	N.ME.3	1	N.ME.3		2	N.FL.6
17	2	N.MR		2		2	G.RE		2	G.RE		2	N.ME.5	1	G.RE		2	N.MR.4
18	2	N.ME.1		1	G.RE	1	G.RE		1	G.RE		1	N.ME.1	1	N.ME.1		2	N.FL.6
19	1	N.MR.8		1	N.MR.7	2	N.MR.7		1	N.MR.7		2	N.ME.1	1	N.MR.7		2	N.FL.6
20	2	N.FL.6		1	N.FL	1	N.FL		2	N.FL		1	N.FL.6	2	N.FL.5		2	N.FL.6
21	2	N.ME.3		1	N.ME	1	N.FL.6		1	N.FL.6		1	N.ME.5	1	N.ME.5		2	N.ME.5
22	2	N.MR.4		2	N.MR.4	1	N.MR.4		1	N.MR.4		2	N.MR.4	2	N.MR.4		1	N.FL.2
23	2	G.GS		2	M.TE.2	2	M.PS.1		1	M.PS.1		3	M.PS.1	1	M.PS.1		2	M.PS.1
24	2	N.MR.1 1		1	N.MR.1 1	1	N.ME.2		1	N.ME.2		1	N.MR.1 1	1	N.MR.1 1		1	N.MR.1 1
25	2	N.ME.3		1	N.ME.2	1	N.ME.2		1	N.ME.2		1	N.ME.2	1	N.ME.2		2	N.ME.2
26	1	N.MR.3		2	N.MR.2	2	N.MR.2		2	N.MR.1		1	N.MR.2	1	N.MR.2		1	N.MR.2
27	1	M.TE.2		1	M.TE.2	2	M.TE.2		1	M.TE.2		2	M.TE.2	1	M.TE.2		2	M.TE.2
28	1	N.ME.3		1	N.ME.3	1	N.ME.3		1	N.MR.1		1	N.ME.3	1	N.ME.3		2	N.ME.3
29	2	G.AN.1		1	G.AN.1	1	G.AN.1		2	G.AN.1		1	G.AN.1	1	G.AN.1		2	G.AN.1
30	2	G.RE.1		2	G.RE.1	2	G.RE.1		2	G.RE.1		2	G.RE.1	2	G.RE.1		2	G.RE.1
31	1	N.MR.4		1	N.MR.4	1	N.MR.4		1	N.MR.4		2	N.MR.4	2	N.MR.4		2	N.MR.4
32	2	G.RE.1		2	G.RE.1	2	G.RE.1		2	G.RE.1		2	G.RE.1	2	G.RE.1		2	G.RE.1
33	1	N.FL.6		1	N.ME.2	1	N.FL.6		1	N.FL.6		1	N.MR.1 1	1	N.ME.1		2	N.FL.6
34	1	N.MR.3		2	N.MR.2	2	N.MR.2		2	N.MR.2		1	N.MR.2	1	N.MR.2		2	N.MR.2
35	1	N.ME.3		1	N.ME.3	1	N.ME.3		1	N.MR.3		1	N.ME.3	1	N.ME.3		2	N.ME.3
36	1	N.ME.3		1	N.ME.3	1	N.ME.3		1	N.MR.3		1	N.ME.3	1	N.ME.3		2	N.ME.3

Table 6.8
DOK Levels and Objectives Coded by Each Reviewer
Michigan Grade 6 Mathematics

37																		
38																		
39																		
40	1	N.FL.6		1	N.ME	1	N.ME		1	N.ME		2	N.FL.6	1	N.ME		2	N.FL.6
41	1	N.MR.11		1	N.FL.6	1	N.FL.6		2	N.FL.6		1	N.ME.2	1	N.ME.1		1	N.ME.2
42	1	N.MR.3		2	N.MR.2	2	N.MR.2		1	N.MR.2		1	N.MR.2	1	N.MR.2		1	N.MR.2
43	2	G.RE.1		2	G.RE.2	2	G.RE.2		2	G.RE.1		2	G.RE.1	2	G.RE.1		2	G.RE.1
44	2	M.TE.1		1	M.TE.1	2	M.TE.1		2	M.TE.1		1	M.TE.1	1	M.TE.1		2	M.TE.1
45	1	M.TE.2		1	M.TE.2	2	M.TE.2		2	M.TE.2		1	M.TE.2	1	M.TE.2		1	M.TE.2
46	1	G.GS.1		1	G.GS.1	1	G.GS.2		1	G.GS.1		1	G.GS.1	1	G.GS.1		2	G.GS.6
47	1	G.GS.5		1	G.GS.4	1	G.GS.3		2	G.GS.3		1	G.GS.4	1	G.GS.4		2	G.GS.3
48	1	N.FL.6		1	N.ME	1	N.ME		1	N.ME		1	N.ME.1	1	N.ME.1		2	N.FL.6
49	1	G.GS.4		1	G.GS.4	1	G.GS.4		2	G.GS.3		1	G.GS.4	1	G.GS.4		1	G.GS.4
50	1	M.PS.1		1	M.PS.1	2	M.TE.1		1	M.TE.1	M.TE.2	2	M.PS.1	1	M.PS.1		1	M.PS.1
51	1	G.GS.2		1	G.GS.1	1	G.GS.1		1	G.GS.1		1	G.GS.1	1	G.GS.1		2	G.GS.1
52	2	N.FL.6		1	N.FL.6	1	N.FL.6		1	N.FL.6		1	N.FL.6	1	N.FL.6		2	N.MR
53	1	M.TE.2		1	M.TE.2	1	M.TE.2		1	M.TE.2		2	M.TE.2	1	M.TE.2		2	M.TE.2
54	1	N.FL.6		2	N.ME	2	N.ME		1	N.ME		2	N.FL.6	1	N.ME		2	N.MR
55	2	G.AN.1		1	G.AN.1	1	G.AN.2		2	G.AN.1		2	G.AN.1	2	G.AN.1		2	G.AN.1
56	2	N.FL.6		2	N.FL.6	2	N.FL.6		2	N.FL.6		2	N.FL.6	2	N.FL.6		2	N.FL.6
57	1	G.GS.1		1	G.GS.1	2	G.GS.1		2	G.GS.6		1	G.GS.1	1	G.GS.1		2	G.GS.1
58	1	G.AN.1		1	G.AN	2	G.AN.1		2	G.AN.1		2	G.AN.2	1	G.AN.1		2	G.AN
59	1	G.GS.4		1	G.GS.5	1	G.GS.4		1	G.GS.4		1	G.GS.4	1	G.GS.4		2	G.GS.4
60																		
61																		
62	2	N.FL.5	N.FL.6	2	N.FL.5	2	N.FL.5		3	N.FL.4		2	M.UN.4	2	N.FL.5	N.FL.4	3	N.FL.5
63	2	N.FL		1		2	G.AN		2	G.AN		2	N.FL.5	1	N.MR		2	N.MR
64	2	N.ME.3	N.FL.6	2	N.FL.6	2	N.FL.6		2	N.FL.6		2	N.FL.6	2	N.FL.6		2	N.FL.6
65	2	G.TR		1	M.TE.2	2	M.TE.2		2	M.TE.2		2	M.PS.1	2	M.PS.1		2	M.PS.1
66	2	M.PS		2	N.ME.2	2	N.ME.2		2	N.ME.2		2	N.ME.2	1	N.ME.2		2	N.ME.2
67	1	N.ME.3	N.MR.11	2	N.MR.11	2	N.MR.11		2	N.ME.5		1	N.MR.11	2	N.MR.11		2	N.ME.5
68	2	M.TE.1		2	M.TE.1	2	M.TE.1		2	M.TE.1		2	M.TE.1	2	M.TE.1		2	M.TE.1
69	1	G.GS.5		1	G.GS.5	2	G.GS.5		2	G.GS.5		1	G.GS.5	1	G.GS.5		2	G.GS.5
70	2	M.TE.1		1	M.TE.1	2	M.TE.1		2	M.TE.1		2	M.TE.1	2	M.TE.1		2	M.TE.1
71	1	G.GS.5		1	G.GS.5	1	G.GS.5		1	G.GS.5		1	G.GS.5	1	G.GS.5		2	G.GS.5
72	1	G.GS.5		1	G.GS.5	1	G.GS.5		1	G.GS.5		1	G.GS.5	1	G.GS.5		1	G.GS.5
73	2	N.MR.3		1	N.MR.4	2	N.MR.3		1	N.MR.4		2	N.MR.3	1	N.MR.3		2	N.MR.4

Table 6.8
DOK Levels and Objectives Coded by Each Reviewer
Michigan Grade 6 Mathematics

74	1	N.MR.7		2	N.MR.7	2	N.MR.7		2	N.MR.7		1	N.MR.7	1	N.MR.7		2	N.ME.1
75	1	N.MR.5		1	N.MR.5	1	N.MR.5		1	N.MR.5		1	N.MR.5	1	N.MR.5		1	N.MR.5
76																		
77																		
78	2	G.RE.2		2	G.RE.2	2	G.RE.2		3	G.RE.2		2	G.RE.2	2	G.RE.2		3	G.RE.2

Pairwise Comparison: 0.607
Standard Pairwise Comparison: 0.9482

Table 6.9
Objectives Coded to Each Item by Reviewers
Michigan Grade 6 Mathematics

Low		Medium		High
0		6.25641		9

1	N.F L.6	N.F L.6	N.F L.6	N.F L.6	N.F L.6	N.F L.6	N.M R.6	
2	N.F L.1	N.M R.4	N.M R.4	N.M R.4	N.M R.4	N.M R.4	N.M R.4	
3	N.F L.1	N.F L.6	N.M R.4	N.M R.4	N.M R.4	N.M R.4	N.M R.5	
4	N.F L.1	N.M R.4	N.M R.4	N.M R.4	N.M R.4	N.M R.4	N.M R.4	
5	N.M E.5	N.F L.2	N.F L.2	N.M R.4	N.M R.4	N.M R.4	N.M R.4	N.M R.4
6	N.F L.2	N.F L.6	N.M R.4	N.M R.4	N.M R.4	N.M R.4	N.M R.4	N.M R.4
7	N.F L.5	N.F L.6	N.M R.1	N.M R.1	N.M R.4	N.M R.4	N.M R.4	
8	M.U N.2	M.U N.4	M.U N.4	M.U N.4	M.U N.4	M.U N.4	M.U N.4	
9	N.M E.5	N.F L.6	M.U N.4	M.U N.4	M.U N.4	M.U N.4	M.P S	
10	M.U N	M.U N.1	M.U N.4	M.U N.4	M.U N.4	M.U N.4	M.U N.4	
11	N.M E.3	N.F L.3	N.F L.6	N.M R	N.M R.1	N.M R.1	N.M R.4	
12	N.M E.3	N.M R.6	N.M R.6	N.M R.6	N.M R.6	N.M R.6	N.M R.7	
13	N.M E.3	N.F L.4	N.F L.4	N.F L.4	N.F L.4	N.F L.4	N.F L.4	
14								
15								
16	N.M E	N.M E	N.M E.3	N.M E.3	N.F L.6	N.M R	N.M R	
17	N.M E.5	N.M R	N.M R.4	G.R E	G.R E	G.R E		
18	N.M E.1	N.M E.1	N.M E.1	N.F L.6	G.R E	G.R E	G.R E	
19	N.M E.1	N.F L.6	N.M R.7	N.M R.7	N.M R.7	N.M R.7	N.M R.8	
20	N.F L	N.F L	N.F L	N.F L.5	N.F L.6	N.F L.6	N.F L.6	
21	N.M	N.M	N.M	N.M	N.M	N.F	N.F	

Table 6.9
Objectives Coded to Each Item by Reviewers
Michigan Grade 6 Mathematics

	E	E.3	E.5	E.5	E.5	L.6	L.6
22	N.F L.2	N.M R.4	N.M R.4	N.M R.4	N.M R.4	N.M R.4	N.M R.4
23	M.P S.1	M.P S.1	M.P S.1	M.P S.1	M.P S.1	M.T E.2	G.G S
24	N.M E.2	N.M E.2	N.M R.11	N.M R.11	N.M R.11	N.M R.11	N.M R.11
25	N.M E.2	N.M E.2	N.M E.2	N.M E.2	N.M E.2	N.M E.2	N.M E.3
26	N.M R.1	N.M R.2	N.M R.2	N.M R.2	N.M R.2	N.M R.2	N.M R.3
27	M.T E.2	M.T E.2	M.T E.2	M.T E.2	M.T E.2	M.T E.2	M.T E.2
28	N.M E.3	N.M E.3	N.M E.3	N.M E.3	N.M E.3	N.M E.3	N.M R.1
29	G.A N.1	G.A N.1	G.A N.1	G.A N.1	G.A N.1	G.A N.1	G.A N.1
30	G.R E.1	G.R E.1	G.R E.1	G.R E.1	G.R E.1	G.R E.1	G.R E.1
31	N.M R.4	N.M R.4	N.M R.4	N.M R.4	N.M R.4	N.M R.4	N.M R.4
32	G.R E.1	G.R E.1	G.R E.1	G.R E.1	G.R E.1	G.R E.1	G.R E.1
33	N.M E.1	N.M E.2	N.F L.6	N.F L.6	N.F L.6	N.F L.6	N.M R.11
34	N.M R.2	N.M R.2	N.M R.2	N.M R.2	N.M R.2	N.M R.2	N.M R.3
35	N.M E.3	N.M E.3	N.M E.3	N.M E.3	N.M E.3	N.M E.3	N.M R.3
36	N.M E.3	N.M E.3	N.M E.3	N.M E.3	N.M E.3	N.M E.3	N.M R.3
37							
38							
39							
40	N.M E	N.M E	N.M E	N.M E	N.F L.6	N.F L.6	N.F L.6
41	N.M E.1	N.M E.2	N.M E.2	N.F L.6	N.F L.6	N.F L.6	N.M R.11
42	N.M R.2	N.M R.2	N.M R.2	N.M R.2	N.M R.2	N.M R.2	N.M R.3
43	G.R E.1	G.R E.1	G.R E.1	G.R E.1	G.R E.1	G.R E.2	G.R E.2
44	M.T	M.T	M.T	M.T	M.T	M.T	M.T

Table 6.9
Objectives Coded to Each Item by Reviewers
Michigan Grade 6 Mathematics

	E.1	E.1	E.1	E.1	E.1	E.1	E.1		
45	M.T E.2	M.T E.2	M.T E.2	M.T E.2	M.T E.2	M.T E.2	M.T E.2		
46	G.G S.1	G.G S.1	G.G S.1	G.G S.1	G.G S.1	G.G S.2	G.G S.6		
47	G.G S.3	G.G S.3	G.G S.3	G.G S.4	G.G S.4	G.G S.4	G.G S.5		
48	N.M E	N.M E	N.M E	N.M E.1	N.M E.1	N.F L.6	N.F L.6		
49	G.G S.3	G.G S.4	G.G S.4	G.G S.4	G.G S.4	G.G S.4	G.G S.4		
50	M.P S.1	M.P S.1	M.P S.1	M.P S.1	M.P S.1	M.T E.1	M.T E.1	M.T E.2	
51	G.G S.1	G.G S.1	G.G S.1	G.G S.1	G.G S.1	G.G S.1	G.G S.2		
52	N.F L.6	N.F L.6	N.F L.6	N.F L.6	N.F L.6	N.F L.6	N.M R		
53	M.T E.2	M.T E.2	M.T E.2	M.T E.2	M.T E.2	M.T E.2	M.T E.2		
54	N.M E	N.M E	N.M E	N.M E	N.F L.6	N.F L.6	N.M R		
55	G.A N.1	G.A N.1	G.A N.1	G.A N.1	G.A N.1	G.A N.1	G.A N.2		
56	N.F L.6	N.F L.6	N.F L.6	N.F L.6	N.F L.6	N.F L.6	N.F L.6		
57	G.G S.1	G.G S.1	G.G S.1	G.G S.1	G.G S.1	G.G S.1	G.G S.6		
58	G.A N	G.A N	G.A N.1	G.A N.1	G.A N.1	G.A N.1	G.A N.2		
59	G.G S.4	G.G S.4	G.G S.4	G.G S.4	G.G S.4	G.G S.4	G.G S.5		
60									
61									
62	N.F L.4	N.F L.4	N.F L.5	N.F L.5	N.F L.5	N.F L.5	N.F L.5	N.F L.6	M.U N.4
63	N.F L	N.F L.5	N.M R	N.M R	G.A N	G.A N			
64	N.M E.3	N.F L.6	N.F L.6	N.F L.6	N.F L.6	N.F L.6	N.F L.6	N.F L.6	
65	M.P S.1	M.P S.1	M.P S.1	M.T E.2	M.T E.2	M.T E.2	G.T R		
66	N.M E.2	N.M E.2	N.M E.2	N.M E.2	N.M E.2	N.M E.2	M.P S		

Table 6.9
Objectives Coded to Each Item by Reviewers
Michigan Grade 6 Mathematics

67	N.M E.3	N.M E.5	N.M E.5	N.M R.11	N.M R.11	N.M R.11	N.M R.11	N.M R.11
68	M.T E.1	M.T E.1	M.T E.1	M.T E.1	M.T E.1	M.T E.1	M.T E.1	
69	G.G S.5	G.G S.5	G.G S.5	G.G S.5	G.G S.5	G.G S.5	G.G S.5	
70	M.T E.1	M.T E.1	M.T E.1	M.T E.1	M.T E.1	M.T E.1	M.T E.1	
71	G.G S.5	G.G S.5	G.G S.5	G.G S.5	G.G S.5	G.G S.5	G.G S.5	
72	G.G S.5	G.G S.5	G.G S.5	G.G S.5	G.G S.5	G.G S.5	G.G S.5	
73	N.M R.3	N.M R.3	N.M R.3	N.M R.3	N.M R.4	N.M R.4	N.M R.4	
74	N.M E.1	N.M R.7	N.M R.7	N.M R.7	N.M R.7	N.M R.7	N.M R.7	
75	N.M R.5	N.M R.5	N.M R.5	N.M R.5	N.M R.5	N.M R.5	N.M R.5	
76								
77								
78	G.R E.2	G.R E.2	G.R E.2	G.R E.2	G.R E.2	G.R E.2	G.R E.2	

Table 6.10
Items Coded by Reviewers to Each Objective
Michigan Grade 6 Mathematics

Low		Medium		High
0		8.714286		54

N																				
N.ME	16	16	21	40	40	40	40	48	48	48	54	54	54	54						
N.ME.1	18	18	18	19	33	41	48	48	74											
N.ME.2	24	24	25	25	25	25	25	25	33	41	41	66	66	66	66	66	66			
N.ME.3	11	12	13	16	16	21	25	28	28	28	28	28	28	35	35	35	35	35	35	36
	36	36	36	36	36	64	67													
N.ME.4																				
N.ME.5	5	9	17	21	21	21	67	67												
N.FL	20	20	20	63																
N.FL.1	2	3	4																	
N.FL.2	5	5	6	22																
N.FL.3	11																			
N.FL.4	13	13	13	13	13	13	62	62												
N.FL.5	7	20	62	62	62	62	62	63												
N.FL.6	1	1	1	1	1	1	3	6	7	9	11	16	18	19	20	20	20	21	21	33
	33	33	33	40	40	40	41	41	41	48	48	52	52	52	52	52	52	54	54	
	56	56	56	56	56	56	56	62	64	64	64	64	64	64	64					
N.MR	11	16	16	17	52	54	63	63												
N.MR.1	7	7	11	11	26	28														
N.MR.2	26	26	26	26	26	34	34	34	34	34	34	42	42	42	42	42	42			
N.MR.3	26	34	35	36	42	73	73	73	73											
N.M	2	2	2	2	2	2	3	3	3	3	4	4	4	4	4	4	5	5	5	5

Table 6.10
Items Coded by Reviewers to Each Objective
Michigan Grade 6 Mathematics

R.4																				
	5	6	6	6	6	6	6	7	7	7	11	17	22	22	22	22	22	22	31	
	31	31	31	31	31	31	73	73	73											
N.M R.5	3	75	75	75	75	75	75	75												
N.M R.6	1	12	12	12	12	12														
N.M R.7	12	19	19	19	19	74	74	74	74	74	74									
N.M R.8	19																			
N.M R.9																				
N.M R.10																				
N.M R.11	24	24	24	24	24	33	41	67	67	67	67	67								
M																				
M.U N	10																			
M.U N.1	10																			
M.U N.2	8																			
M.U N.3																				
M.U N.4	8	8	8	8	8	8	9	9	9	9	10	10	10	10	10	62				
M.P S	9	66																		
M.P S.1	23	23	23	23	23	50	50	50	50	50	65	65	65							
M.P S.2																				
M.T E																				
M.T E.1	44	44	44	44	44	44	44	50	50	68	68	68	68	68	68	68	70	70	70	70
	70	70	70																	
M.T E.2	23	27	27	27	27	27	27	27	45	45	45	45	45	45	45	50	53	53	53	53
	53	53	53	65	65	65														
G																				

Table 6.10
Items Coded by Reviewers to Each Objective
Michigan Grade 6 Mathematics

G.GS	23																			
G.GS.1	46	46	46	46	46	51	51	51	51	51	51	57	57	57	57	57	57			
G.GS.2	46	51																		
G.GS.3	47	47	47	49																
G.GS.4	47	47	47	49	49	49	49	49	49	59	59	59	59	59	59					
G.GS.5	47	59	69	69	69	69	69	69	69	71	71	71	71	71	71	71	72	72	72	72
	72	72	72																	
G.GS.6	46	57																		
G.TR	65																			
G.TR.1																				
D																				
G.RE	17	17	17	18	18	18														
G.RE.1	30	30	30	30	30	30	30	32	32	32	32	32	32	32	43	43	43	43	43	
G.RE.2	43	43	78	78	78	78	78	78	78											
G.AN	58	58	63	63																
G.AN.1	29	29	29	29	29	29	29	55	55	55	55	55	55	58	58	58	58			
G.AN.2	55	58																		

Table 6.11
Number of Reviewers Coding an Item by Objective (Item Number: Number of Reviewers)
Michigan Grade 6 Mathematics

Low		Medium		High
1		6		12

N													
N.ME	16:2	21:1	40:4	48:3	54:4								
N.ME.1	18:3	19:1	33:1	41:1	48:2	74:1							
N.ME.2	24:2	25:6	33:1	41:2	66:6								
N.ME.3	11:1	12:1	13:1	16:2	21:1	25:1	28:6	35:6	36:6	64:1	67:1		
N.ME.4													
N.ME.5	5:1	9:1	17:1	21:3	67:2								
N.FL	20:3	63:1											
N.FL.1	2:1	3:1	4:1										
N.FL.2	5:2	6:1	22:1										
N.FL.3	11:1												
N.FL.4	13:6	62:2											
N.FL.5	7:1	20:1	62:5	63:1									
N.FL.6	1:6	3:1	6:1	7:1	9:1	11:1	16:1	18:1	19:1	20:3	21:2	33:4	40:3
	41:3	48:2	52:6	54:2	56:7	62:1	64:7						
N.MR	11:1	16:2	17:1	52:1	54:1	63:2							
N.MR.1	7:2	11:2	26:1	28:1									
N.MR.2	26:5	34:6	42:6										
N.MR.3	26:1	34:1	35:1	36:1	42:1	73:4							
N.MR.4	2:6	3:4	4:6	5:5	6:6	7:3	11:1	17:1	22:6	31:7	73:3		
N.M	3:1	75:7											

Table 6.11
Number of Reviewers Coding an Item by Objective (Item Number: Number of Reviewers)
Michigan Grade 6 Mathematics

R.5						
N.M R.6	1:1	12:5				
N.M R.7	12:1	19:4	74:6			
N.M R.8	19:1					
N.M R.9						
N.M R.10						
N.M R.11	24:5	33:1	41:1	67:5		
M						
M.U N	10:1					
M.U N.1	10:1					
M.U N.2	8:1					
M.U N.3						
M.U N.4	8:6	9:4	10:5	62:1		
M.P S	9:1	66:1				
M.P S.1	23:5	50:5	65:3			
M.P S.2						
M.T E						
M.T E.1	44:7	50:2	68:7	70:7		
M.T E.2	23:1	27:7	45:7	50:1	53:7	65:3
G						
G.G S	23:1					
G.G S.1	46:5	51:6	57:6			
G.G S.2	46:1	51:1				

Table 6.11
Number of Reviewers Coding an Item by Objective (Item Number: Number of Reviewers)
Michigan Grade 6 Mathematics

G.GS.3	47:3	49:1			
G.GS.4	47:3	49:6	59:6		
G.GS.5	47:1	59:1	69:7	71:7	72:7
G.GS.6	46:1	57:1			
G.TR	65:1				
G.TR.1					
D					
G.RE	17:3	18:3			
G.RE.1	30:7	32:7	43:5		
G.RE.2	43:2	78:7			
G.AN	58:2	63:2			
G.AN.1	29:7	55:6	58:4		
G.AN.2	55:1	58:1			

Table 6.13
Assessment Item DOK vs Consensus DOK (Item Number: Number of Reviewers [Average DOK])
Michigan Grade 6 Mathematics

Low DOK		Matched DOK		High DOK
1		6		12

N [1]:										
N.ME [1]:	16:2 [1]	21:1 [1]	40:4 [1]	48:3 [1]	54:4 [1.5]					
N.ME.1 [1]:	18:3 [1.33]	19:1 [2]	33:1 [1]	41:1 [1]	48:2 [1]	74:1 [2]				
N.ME.2 [1]:	24:2 [1]	25:6 [1.17]	33:1 [1]	41:2 [1]	66:6 [1.83]					
N.ME.3 [1]:	11:1 [2]	12:1 [2]	13:1 [1]	16:2 [1.5]	21:1 [2]	25:1 [2]	28:6 [1.17]	35:6 [1.17]	36:6 [1.17]	64:1 [2]	67:1 [1]
N.ME.4 [1]:											
N.ME.5 [2]:	5:1[2]	9:1[2]	17:1 [2]	21:3 [1.33]	67:2 [2]					
N.FL [2]:	20:3 [1.33]	63:1 [2]								
N.FL.1 [2]:	2:1[2]	3:1[2]	4:1[2]							
N.FL.2 [1]:	5:2[1.5]	6:1[1]	22:1 [1]							
N.FL.3 [1]:	11:1 [1]									
N.FL.4 [1]:	13:6 [1.17]	62:2 [2.5]								
N.FL.5 [2]:	7:1[2]	20:1 [2]	62:5 [2.2]	63:1 [2]						

Table 6.13

Assessment Item DOK vs Consensus DOK (Item Number: Number of Reviewers [Average DOK])

Michigan Grade 6 Mathematics

N.FL.6 [2]:	1:6[1.67]	3:1[2]	6:1[2]	7:1[2]	9:1[2]	11:1[1]	16:1[2]	18:1[2]	19:1[2]	20:3[1.67]	21:2[1]	33:4[1.25]	40:3[1.67]
	41:3[1.33]	48:2[1.5]	52:6[1.17]	54:2[1.5]	56:7[2]	62:1[2]	64:7[2]						
N.MR [1]:	11:1[2]	16:2[1]	17:1[2]	52:1[2]	54:1[2]	63:2[1.5]							
N.MR.1 [1]:	7:2[2]	11:2[1.5]	26:1[2]	28:1[1]									
N.MR.2 [1]:	26:5[1.4]	34:6[1.67]	42:6[1.33]										
N.MR.3 [2]:	26:1[1]	34:1[1]	35:1[1]	36:1[1]	42:1[1]	73:4[1.75]							
N.MR.4 [2]:	2:6[1.5]	3:4[1.25]	4:6[1.67]	5:5[1.6]	6:6[1.83]	7:3[2]	11:1[1]	17:1[2]	22:6[1.67]	31:7[1.43]	73:3[1.33]		
N.MR.5 [2]:	3:1[2]	75:7[1]											
N.MR.6 [1]:	1:1[2]	12:5[1.2]											
N.MR.7 [1]:	12:1[2]	19:4[1.25]	74:6[1.5]										
N.MR.8 [1]:	19:1[1]												
N.MR.9 [2]:													
N.MR.10 [2]:													
N.MR.11 [1]:	24:5[1.2]	33:1[1]	41:1[1]	67:5[1.6]									
M													

Table 6.13
Assessment Item DOK vs Consensus DOK (Item Number: Number of Reviewers [Average DOK])
Michigan Grade 6 Mathematics

[2]:						
M.UN [1]:	10:1 [1]					
M.UN.1 [1]:	10:1 [2]					
M.UN.2 [1]:	8:1[1]					
M.UN.3 [1]:						
M.UN.4 [1]:	8:6[1.33]	9:4[2]	10:5 [1.8]	62:1 [2]		
M.PS [2]:	9:1[2]	66:1 [2]				
M.PS.1 [2]:	23:5 [1.8]	50:5 [1.2]	65:3 [2]			
M.PS.2 [2]:						
M.TE [2]:						
M.TE.1 [2]:	44:7 [1.57]	50:2 [1.5]	68:7 [2]	70:7 [1.86]		
M.TE.2 [2]:	23:1 [2]	27:7 [1.43]	45:7 [1.29]	50:1 [1]	53:7 [1.29]	65:3 [1.67]
G [1]:						
G.GS [2]:	23:1 [2]					
G.GS.1 [1]:	46:5 [1]	51:6 [1.17]	57:6 [1.33]			
G.G	46:1	51:1				

Table 6.13
Assessment Item DOK vs Consensus DOK (Item Number: Number of Reviewers [Average DOK])
Michigan Grade 6 Mathematics

S.2 [1]:	[1]	[1]			
G.GS.3 [2]:	47:3 [1.67]	49:1 [2]			
G.GS.4 [1]:	47:3 [1]	49:6 [1]	59:6 [1.17]		
G.GS.5 [2]:	47:1 [1]	59:1 [1]	69:7 [1.43]	71:7 [1.14]	72:7 [1]
G.GS.6 [2]:	46:1 [2]	57:1 [2]			
G.TR [1]:	65:1 [2]				
G.TR.1 [1]:					
D [2]:					
G.RE [2]:	17:3 [1.67]	18:3 [1]			
G.RE.1 [2]:	30:7 [2]	32:7 [2]	43:5 [2]		
G.RE.2 [2]:	43:2 [2]	78:7 [2.29]			
G.AN [2]:	58:2 [1.5]	63:2 [2]			
G.AN.1 [2]:	29:7 [1.43]	55:6 [1.83]	58:4 [1.5]		
G.AN.2 [2]:	55:1 [1]	58:1 [2]			

Table 7.1
Categorical Concurrence Between Standards and Assessment as Rated by Six Reviewers
Michigan Grade 7 Mathematics
Number of Assessment Items - 71

Standards			Level by Objective			Hits		Cat. Concurr.
Title	Goals #	Objs #	Level	# of objs by Level	% w/in std by Level	Mean	S.D.	
N - Number & Operations	3	22	1 2	15 5	75 25	31.5	2.14	YES
A - Algebra	3	15	1 2	7 7	50 50	22	1.41	YES
M - Measurement	3	4.5	1 2	1 2	33 66	5.83	2.11	NO
G - Geometry	2	4.5	1 2	1 3	25 75	7.5	1.5	YES
D - Data & Probability	1	2.5	1 2	1 1	50 50	4	0	NO
Total	12	48.5	1 2	25 18	58 41	70.83	0.37	

Table 7.2
Depth-of-Knowledge Consistency Between Standards and Assessment as Rated by Six Reviewers
Michigan Grade 7 Mathematics
Number of Assessment Items - 71

Standards			Hits		Level of Item w.r.t. Standard						DOK Consistency
					% Under		% At		% Above		
Title	Goals #	Objs #	M	S.D.	M	S.D.	M	S.D.	M	S.D.	
N - Number & Operations	3	22	31.5	2.14	12	28	74	39	14	33	YES
A - Algebra	3	15	22	1.41	16	29	59	42	24	41	YES
M - Measurement	3	4.5	5.83	2.11	27	44	43	42	30	37	YES
G - Geometry	2	4.5	7.5	1.5	36	39	61	39	4	15	YES
D - Data & Probability	1	2.5	4	0	42	47	45	46	12	29	YES
Total	12	48.5	70.83	0.37	19	34	64	42	17	35	

Table 7.3

Range-of-Knowledge Correspondence and Balance of Representation Between Standards and Assessment as Rated by Six Reviewers
Michigan Grade 7 Mathematics
Number of Assessment Items - 71

Standards			Hits		Range of Objectives				Rng. of Know.	Balance Index				Bal. of Represent.
					# Objs Hit		% of Total			% Hits in Std/Ttl Hits		Index		
Title	Goals #	Objs #	Mean	S.D.	Mean	S.D.	Mean	S.D.		Mean	S.D.	Mean	S.D.	
N - Number & Operations	3	22	31.5	2.14	13	2.24	59	7	YES	44	3	0.72	0.08	YES
A - Algebra	3	15	22	1.41	7.67	1.37	51	9	YES	31	2	0.70	0.04	YES
M - Measurement	3	4.5	5.83	2.11	2.5	1.61	50	17	YES	8	3	0.89	0.12	YES
G - Geometry	2	4.5	7.5	1.5	3.17	0.37	71	8	YES	11	2	0.81	0.12	YES
D - Data & Probability	1	2.5	4	0	1.83	0.37	75	19	YES	6	0	0.79	0.09	YES
Total	12	48.5	70.83	0.37	5.63	4.44	61	16		20	15	0.78	0.12	

Table 7.4
Summary of Attainment of Acceptable Alignment Level on Four Content Focus Criteria as Rated by Six Reviewers
Michigan Grade 7 Mathematics
Number of Assessment Items - 71

Standards	Alignment Criteria			
	Categorical Concurrence	Depth-of-Knowledge Consistency	Range of Knowledge	Balance of Representation
N - Number & Operations	YES	YES	YES	YES
A - Algebra	YES	YES	YES	YES
M - Measurement	NO	YES	YES	YES
G - Geometry	YES	YES	YES	YES
D - Data & Probability	NO	YES	YES	YES

Table 7.5
Source-of-Challenge Issues by Reviewer
Michigan Grade 7 Mathematics

Item Number	Comments by Reviewer
49	This problem should be revised or dumped. X^2 could represent the final term, the rule, or the fifth term. This is confusing, so students may miss this question for reasons other than not understanding what the designers wanted to assess.
49	This item seems rather inappropriate for students at the grade level. This problem introduces quadratic expressions, and yet the GLCES for this grade level are restricted to linear cases only.
49	This is a misleading question (item 49). Students may not distinguish between x as a term and x square.
49	I am assuming that D is the answer you are looking for. In a sequence, x is a counter for the xth term. Also write the sequence with .....between 16 and x^2. Students are being mislead.
51	Matches expectation in another grade. Compare measure in cmsq to m sq.
55	Item 55 relates to expectations in lower grade--decompose and compose area
60	The notation on the answers may not be appropriate for students at this grade level.

Table 7.6
Depth-of-Knowledge Levels by Item and Reviewers
Intraclass Correlation
Michigan Grade 7 Mathematics

Item	Rater 1	Rater 2	Rater 3	Rater 4	Rater 5	Rater 8
1	1	1	1	1	1	1
2	1	1	1	1	1	1
3	1	1	2	2	2	1
4	1	1	1	1	1	1
5	1	1	2	2	2	1
6	2	2	2	2	2	2
7	1	1	1	1	1	1
8	2	2	2	2	2	2
9						
10	1	1	1	1	1	1
11	1	1	1	2	2	2
12	2	1	2	2	2	2
13	2	1	2	2	2	2
14	2	2	1	1	1	1
15	1	1	1	1	1	1
16	2	1	1	1	2	1
17	2	1	1	1	1	1
18	2	2	2	1	2	2
19	2	2	2	2	2	2
20	2	2	1	1	1	2
21	2	1	1	1	1	1
22	2	2	2	1	1	2
23	2	2	2	2	2	2
24	1	1	1	1	2	1
25	1	1	2	1	1	2
26	1	1	1	1	2	2
27	2	1	1	1	1	1
28	1	1	1	1	1	1
29	2	2	2	2	2	2
30	2	1	1	2	2	2
31						
32						
33	2	2	2	1	1	1
34	1	1	1	1	2	1
35	2	1	2	1	2	1
36	2	1	1	1	1	1
37	2	1	1	2	1	1
38	2	2	2	1	1	1
39	2	1	2	1	1	1
40	1	1	2	1	1	1

Table 7.6
Depth-of-Knowledge Levels by Item and Reviewers
Intraclass Correlation
Michigan Grade 7 Mathematics

41	2	2	2	2	2	2
42	2	2	2	1	1	1
43	2	2	2	1	2	2
44	2	2	1	2	2	1
45	2	2	1	1	1	1
46	1	2	2	1	2	2
47	1	1	1	1	1	1
48	2	2	1	1	1	2
49	1	2	2	2	2	2
50	2	2	2	1	2	2
51	1	2	1	2	2	2
52	2	1	2	1	1	1
53						
54						
55	2	1	2	1	2	1
56	2	1	1	1	2	1
57	2	1	2	1	2	1
58	2	2	2	2	1	2
59	2	2	2	1	1	2
60	1	2	2	2	2	1
61	2	2	2	2	2	2
62	2	1	2	1	1	2
63	2	2	2	2	1	2
64	2	2	2	2	2	2
65	2	2	2	2	2	2
66	2	2	2	2	2	2
67	1	2	2	1	1	2
68	2	2	2	1	2	1
69	1	2	2	1	1	2
70	1	2	2	1	1	2
71	1	2	2	1	1	2
72	2	2	2	2	2	2
73	2	1	1	1	1	2
74	1	1	1	1	1	1
75	2	1	2	1	2	1
76						
77						
78						
79	1	1	2	1	1	1

Table 7.6
Depth-of-Knowledge Levels by Item and Reviewers
Intraclass Correlation
Michigan Grade 7 Mathematics

Intraclass Correlation: 0.7298
Pairwise Comparison: 0.646

Table 7.7
Notes by Reviewer
Michigan Grade 7 Mathematics

Item Number	Comments by Reviewer
1	It's an applied problem/word problem involving rational numbers.
2	Nothing seems to directly relate to the properties.
3	order of operations
5	There is no expectation that explicitly deals with order of operations (and there should be if items like this are to be on the test).
6	This not only involves planning what to do (both multiplication and division) but conversion of measurement units
8	This is an applied problem dealing with multiplication, which is not listed in any of the expectations.
8	Must solve a word problem after determining which steps (involving multiplication and subtraction) to use.
10	Finding area of parallelogram - just need to know and apply formula - but not mentioned in 6th grade objectives.
11	This is checking an division problem with the algrorithm or formula. Don't see an objetive tht matches directly in 6th grade.
14	Not listed directly - is it problem solving?
18	This is a problem solving situation which is not addressed as solving withmult or div. of fractions
24	Doesn't mention additive inverse with a rational number - or open sentences
33	See note on this problem on the 6th grade test.
43	Problem Solving and division with fractions
46	Unsure of this one
55	This problem goes under a generic strand in this exam than in the 6th grade test because the MPS domain does not exist for this grade level.
56	Same comment as for # 55.
56	Matches expectation in lower grade. Find the area of a parallelogram.
65	This is contrived and unrealistic problem.

Table 7.8
DOK Levels and Objectives Coded by Each Reviewer
Michigan Grade 7 Mathematics

Item	DOK0	PObj0	DOK1	PObj1	DOK2	PObj2	DOK3	PObj3	DOK4	PObj4	DOK7	PObj7
1	1	N.FL.8	1	N.FL	1	N.FL.8	1	N.FL.4	1	N.FL.4	1	N.FL.8
2	1	N.FL.4	1	N.FL.3	1	N.ME	1	N.FL	1	N.FL.1	1	N.FL.4
3	1	N.FL.3	1	N.FL	2	N.FL.4	2	N.FL.4	2	N.FL.4	1	N.FL.4
4	1	N.FL.2	1	N.FL.2	1	N.FL.2	1	N.FL.2	1	N.FL.2	1	N.FL.4
5	1	N.FL.4	1	N.FL	2	N.FL.4	2	N.FL.4	2	N.FL.4	1	N.FL.4
6	2	M.UN.1	2	M.UN.1	2	M.UN.1	2	M.PS	2	M.PS	2	M.UN.1
7	1	N.FL.2	1	N.FL.2	1	N.FL.4	1	N.FL.2	1	N.FL.2	1	N.FL.4
8	2	N.FL.8	2	N.FL	2	N.FL.8	2	N.FL.4	2	N.FL.4	2	N.FL.8
9												
10	1	G.GS	1	G	1	G	1	M	1	M.UN	1	G.GS.1
11	1	N.FL.4	1	N.MR	1	N.MR	2	N.MR	2	N.MR	2	N.FL.1
12	2	A.FO.4	1	A.FO.4	2	A.FO.4	2	A.FO.4	2	A.FO.4	2	A.FO.6
13	2	A.FO.4	1	A.FO.4	2	A.FO.4	2	A.FO.4	2	A.FO.4	2	A.FO.6
14	2	N.FL.8	2	N.FL.8	1	N.FL.4	1	N.FL.8	1	N.FL.8	1	N.FL.8
15	1	N.ME.6	1	N.ME.9	1	N.ME.9	1	N.ME.9	1	N.ME.9	1	N.ME.6
16	2	D.PR.1	1	D.PR.1	1	D.PR.1	1	D.PR.2	2	D.PR.2	1	D.PR.1
17	2	A.RP.3	1	A.RP.3	1	A.RP.3	1	A.RP.3	1	A.RP.3	1	A.RP.3
18	2	N.FL.8	2	N.FL.1	2	N.FL.4	1	N.FL.1	2	N.FL.1	2	N.FL.8
19	2	A.FO.4	2	N.FL	2	N.FL.8	2	N.FL.8	2	N.FL.8	2	A.FO.4
20	2	N.FL.8	2	N.FL.8	1	N.FL.8	1	N.FL.8	1	N.FL.8	2	N.FL.8
21	2	A.RP.3	1	A.RP.3	1	A.RP.3	1	A.RP.3	1	A.RP.3	1	A.RP.3
22	2	A.FO.3	2	A.FO.3	2	A.FO.4	1	A.FO.3	1	A.FO.3	2	A.FO.4
23	2	N.FL.6	2	N.FL.6	2	N.FL.6	2	N.FL.6	2	N.FL.6	2	N.FL.6
24	1	N.FL	1	N.ME.6	1	N.ME.6	1	N.MR.2	2	N.MR.2	1	N.ME.6
25	1	G.GS.2	1	G.GS.2	2	G.GS.2	1	G.GS.2	1	G.GS.2	2	G.GS.1
26	1	A.FO.9	1	A.FO	1	A.FO.9	1	A.FO.9	2	A.FO.4	2	A.FO.8
27	2	A.RP.3	1	A.RP.3	1	A.RP.3	1	A.RP.3	1	M	1	A.RP.3
28	1	N.ME.6	1	N.ME	1	N.ME.6	1	N.ME.1	1	N.ME.1	1	N.ME.1
29	2	N.FL.1	2	N.FL.1	2	N.FL.1	2	N.FL.1	2	N.FL.1	2	N.FL.1
30	2	A.PA.1	1	A.PA.1	1	N.FL.8	2	A.PA.1	2	A.PA.1	2	A.PA.1
31												
32												
33	2	N.FL.7	2	N.FL.7	2	N.FL.7	1	N.FL.7	1	N.FL.7	1	N.FL.7
34	1	N.ME.3	1	N.ME.2	1	N.ME.7	1	N.ME.3	2	N.ME.3	1	N.ME.3
35	2	A.FO.4	1	A.FO.4	2	A.FO.4	1	A.FO.4	2	A.FO.4	1	A.FO.4
36	2	D.PR.1	1	D.PR.1	1	D.PR.1	1	D.PR	1	D.PR	1	D.PR.1
37	2	N.FL.2	1	A.PA.1	1	N.FL.8	2	A.PA.1	1	A.PA.1	1	A.PA.1
38	2	A.FO.4	2	A.FO.4	2	A.FO.4	1	A.FO.4	1	A.FO.4	1	A.FO.4

Table 7.8
DOK Levels and Objectives Coded by Each Reviewer
Michigan Grade 7 Mathematics

39	2	A.FO.1	1	A.FO.3	2	A.FO.4	1	A.FO.4	1	A.FO.4	1	A.FO.4
40	1	M.UN.1	1	M.UN.1	2	M.UN.1	1	M.UN.1	1	M.UN.1	1	M.UN.1
41	2	N.FL.6	2	A.PA.1	2	N.FL.8	2	N.FL.8	2	N.FL.8	2	N.FL.8
42	2	N.ME.4	2	N.ME.4	2	N.ME.4	1	N.ME.4	1	N.ME.4	1	N.ME.4
43	2	N.FL.1	2	N.FL.7	2	N.FL.8	1	N.FL	2	N.FL	2	N.FL.8
44	2	N.FL.7	2	N.FL.7	1	N.FL.4	2	N.FL.8	2	N.FL.8	1	N.FL.7
45	2	G.TR.1	2	G.TR.1	1	G.TR.1	1	G.TR.1	1	G.TR.1	1	G.TR.1
46	1	N.FL.4	2	A.FO.7	2	A.FO.9	1	A.FO	2	A.FO	2	A.FO.9
47	1	G.GS.2	1	G.GS.2	1	G.GS.2	1	G.TR.1	1	G.TR.1	1	G.GS.2
48	2	A.FO.4	2	A.FO.4	1	A.FO.4	1	A.FO.4	1	A.FO.4	2	N.FL.1
49	1	A.FO.1	2		2	A.FO.4	2	A.PA	2	A.PA	2	A.FO.3
50	2	A.PA.1	2	A.PA.1	2	N.FL.8	1	A.PA.1	2	A.PA.1	2	A.PA.1
51	1	M.UN.1	2	M.UN	1	G	2	M.UN.1	2	M.UN.1	2	M.UN.1
52	2	N.ME.4	1	N.ME.3	2	N.ME.4	1	N.ME.4	1	N.ME.4	1	N.ME.4
53												
54												
55	2	G.GS	1	M	2	G	1	M.TE	2	M.TE	1	N.FL.7
56	2	G.GS	1	M	1	G	1	M.TE	2	M.TE	1	N.FL.8
57	2	G.TR.1	1	G.TR.1	2	G.TR.1	1	G.TR.1	2	G.TR.1	1	G.TR.1
58	2	M.UN.1	2	N.FL.1	2	N.FL.4	2	M.UN.1	1	M.UN.1	2	N.FL.8
59	2	N.FL.6	2	N.FL.5	2	N.FL.6	1	N.FL.5	1	N.FL.5	2	N.FL.6
60	1	G.GS.2	2	G.GS.1	2	G.GS.2	2	G.GS.1	2	G.GS.1	1	G.GS.1
61	2	N.FL.6	2	N.FL.6	2	N.FL.6	2	N.FL.6	2	N.FL.6	2	N.FL.6
62	2	D.PR.1	1	D.PR.1	2	D.PR.2	1	D.PR.2	1	D.PR.2	2	D.PR.2
63	2	A.RP.2	2	A	2	A.FO.8	2	A.FO.8	1	A.FO.8	2	A.FO.8
64	2	A.FO.9	2	A.FO.6	2	A.FO.4	2	A.FO.4	2	A.FO.4	2	A.FO.4
65	2	N.FL.2	2	N.FL.1	2	N.FL.8	2	N.ME	2	N.ME	2	N.FL.8
66	2	N.FL.7	2	N.FL.7	2	N.FL.8	2	N.ME	2	N.ME	2	N.FL.7
67	1	A.PA.2	2	A.FO.8	2	A.FO.9	1	A.FO	1	A.FO	2	A.FO.9
68	2	A.FO.4	2	A.FO.4	2	N.FL.4	1	A.FO.4	2	A.FO.4	1	N.FL.1
69	1	A.FO.5	2	A.FO.7	2	A.FO.9	1	A.FO	1	A.FO	2	A.FO.7
70	1	A.FO.5	2	A.FO.7	2	A.FO.7	1	A.FO	1	A.FO	2	A.FO.7
71	1	M.UN.1	2	M.UN.1	2	M.UN.1	1	M.UN.1	1	M.UN.1	2	M.UN.1
72	2	A.FO.4	2	N.FL.8	2	N.FL.6	2	N.FL.6	2	N.FL.6	2	N.FL.6
73	2	D.PR.1	1	D.PR	1	D.PR.1	1	D.PR.2	1	D.PR.2	2	D.PR.1
74	1	N.FL.5	1	N.FL.5	1	N.FL.6	1	N.FL.5	1	N.FL.5	1	N.FL.7
75	2	A.FO.4	1	A.FO.4	2	A.FO.4	1	A.FO.4	2	A.FO.4	1	A.FO.4
76												
77												

Table 7.8
DOK Levels and Objectives Coded by Each Reviewer
Michigan Grade 7 Mathematics

78												
79	1	G.TR.1	1	G.TR.1	2	G.TR.1	1	G.TR.1	1	G.TR.1	1	G.TR.1

Pairwise Comparison: 0.5183
Standard Pairwise Comparison: 0.8986

Table 7.9
Objectives Coded to Each Item by Reviewers
Michigan Grade 7 Mathematics

Low		Medium		High
0		5.379747		6

1	N.FL	N.FL.4	N.FL.4	N.FL.8	N.FL.8	N.FL.8
2	N.ME	N.FL	N.FL.1	N.FL.3	N.FL.4	N.FL.4
3	N.FL	N.FL.3	N.FL.4	N.FL.4	N.FL.4	N.FL.4
4	N.FL.2	N.FL.2	N.FL.2	N.FL.2	N.FL.2	N.FL.4
5	N.FL	N.FL.4	N.FL.4	N.FL.4	N.FL.4	N.FL.4
6	M.UN.1	M.UN.1	M.UN.1	M.UN.1	M.PS	M.PS
7	N.FL.2	N.FL.2	N.FL.2	N.FL.2	N.FL.4	N.FL.4
8	N.FL	N.FL.4	N.FL.4	N.FL.8	N.FL.8	N.FL.8
9						
10	M	M.UN	G	G	G.GS	G.GS.1
11	N.FL.1	N.FL.4	N.MR	N.MR	N.MR	N.MR
12	A.FO.4	A.FO.4	A.FO.4	A.FO.4	A.FO.4	A.FO.6
13	A.FO.4	A.FO.4	A.FO.4	A.FO.4	A.FO.4	A.FO.6
14	N.FL.4	N.FL.8	N.FL.8	N.FL.8	N.FL.8	N.FL.8
15	N.ME.6	N.ME.6	N.ME.9	N.ME.9	N.ME.9	N.ME.9
16	D.PR.1	D.PR.1	D.PR.1	D.PR.1	D.PR.2	D.PR.2
17	A.RP.3	A.RP.3	A.RP.3	A.RP.3	A.RP.3	A.RP.3
18	N.FL.1	N.FL.1	N.FL.1	N.FL.4	N.FL.8	N.FL.8
19	N.FL	N.FL.8	N.FL.8	N.FL.8	A.FO.4	A.FO.4
20	N.FL.8	N.FL.8	N.FL.8	N.FL.8	N.FL.8	N.FL.8

Table 7.9
Objectives Coded to Each Item by Reviewers
Michigan Grade 7 Mathematics

21	A.R P.3	A.R P.3	A.R P.3	A.R P.3	A.R P.3	A.R P.3
22	A.F O.3	A.F O.3	A.F O.3	A.F O.3	A.F O.4	A.F O.4
23	N.F L.6	N.F L.6	N.F L.6	N.F L.6	N.F L.6	N.F L.6
24	N.M E.6	N.M E.6	N.M E.6	N.F L	N.M R.2	N.M R.2
25	G.G S.1	G.G S.2	G.G S.2	G.G S.2	G.G S.2	G.G S.2
26	A.F O	A.F O.4	A.F O.8	A.F O.9	A.F O.9	A.F O.9
27	A.R P.3	A.R P.3	A.R P.3	A.R P.3	A.R P.3	M
28	N.M E	N.M E.1	N.M E.1	N.M E.1	N.M E.6	N.M E.6
29	N.F L.1	N.F L.1	N.F L.1	N.F L.1	N.F L.1	N.F L.1
30	N.F L.8	A.P A.1	A.P A.1	A.P A.1	A.P A.1	A.P A.1
31						
32						
33	N.F L.7	N.F L.7	N.F L.7	N.F L.7	N.F L.7	N.F L.7
34	N.M E.2	N.M E.3	N.M E.3	N.M E.3	N.M E.3	N.M E.7
35	A.F O.4	A.F O.4	A.F O.4	A.F O.4	A.F O.4	A.F O.4
36	D.P R	D.P R	D.P R.1	D.P R.1	D.P R.1	D.P R.1
37	N.F L.2	N.F L.8	A.P A.1	A.P A.1	A.P A.1	A.P A.1
38	A.F O.4	A.F O.4	A.F O.4	A.F O.4	A.F O.4	A.F O.4
39	A.F O.1	A.F O.3	A.F O.4	A.F O.4	A.F O.4	A.F O.4
40	M.U N.1	M.U N.1	M.U N.1	M.U N.1	M.U N.1	M.U N.1
41	N.F L.6	N.F L.8	N.F L.8	N.F L.8	N.F L.8	A.P A.1
42	N.M E.4	N.M E.4	N.M E.4	N.M E.4	N.M E.4	N.M E.4
43	N.F	N.F	N.F	N.F	N.F	N.F

Table 7.9
Objectives Coded to Each Item by Reviewers
Michigan Grade 7 Mathematics

	L	L	L.1	L.7	L.8	L.8
44	N.F L.4	N.F L.7	N.F L.7	N.F L.7	N.F L.8	N.F L.8
45	G.T R.1	G.T R.1	G.T R.1	G.T R.1	G.T R.1	G.T R.1
46	N.F L.4	A.F O	A.F O	A.F O.7	A.F O.9	A.F O.9
47	G.G S.2	G.G S.2	G.G S.2	G.G S.2	G.T R.1	G.T R.1
48	N.F L.1	A.F O.4	A.F O.4	A.F O.4	A.F O.4	A.F O.4
49	A.P A	A.P A	A.F O.1	A.F O.3	A.F O.4	
50	N.F L.8	A.P A.1	A.P A.1	A.P A.1	A.P A.1	A.P A.1
51	M.U N	M.U N.1	M.U N.1	M.U N.1	M.U N.1	G
52	N.M E.3	N.M E.4	N.M E.4	N.M E.4	N.M E.4	N.M E.4
53						
54						
55	N.F L.7	M	M.T E	M.T E	G	G.G S
56	N.F L.8	M	M.T E	M.T E	G	G.G S
57	G.T R.1	G.T R.1	G.T R.1	G.T R.1	G.T R.1	G.T R.1
58	N.F L.1	N.F L.4	N.F L.8	M.U N.1	M.U N.1	M.U N.1
59	N.F L.5	N.F L.5	N.F L.5	N.F L.6	N.F L.6	N.F L.6
60	G.G S.1	G.G S.1	G.G S.1	G.G S.1	G.G S.2	G.G S.2
61	N.F L.6	N.F L.6	N.F L.6	N.F L.6	N.F L.6	N.F L.6
62	D.P R.1	D.P R.1	D.P R.2	D.P R.2	D.P R.2	D.P R.2
63	A	A.F O.8	A.F O.8	A.F O.8	A.F O.8	A.R P.2
64	A.F O.4	A.F O.4	A.F O.4	A.F O.4	A.F O.6	A.F O.9
65	N.M E	N.M E	N.F L.1	N.F L.2	N.F L.8	N.F L.8

Table 7.9
Objectives Coded to Each Item by Reviewers
Michigan Grade 7 Mathematics

66	N.ME	N.ME	N.FL.7	N.FL.7	N.FL.7	N.FL.8
67	A.PA.2	A.FO	A.FO	A.FO.8	A.FO.9	A.FO.9
68	N.FL.1	N.FL.4	A.FO.4	A.FO.4	A.FO.4	A.FO.4
69	A.FO	A.FO	A.FO.5	A.FO.7	A.FO.7	A.FO.9
70	A.FO	A.FO	A.FO.5	A.FO.7	A.FO.7	A.FO.7
71	M.UN.1	M.UN.1	M.UN.1	M.UN.1	M.UN.1	M.UN.1
72	N.FL.6	N.FL.6	N.FL.6	N.FL.6	N.FL.8	A.FO.4
73	D.PR	D.PR.1	D.PR.1	D.PR.1	D.PR.2	D.PR.2
74	N.FL.5	N.FL.5	N.FL.5	N.FL.5	N.FL.6	N.FL.7
75	A.FO.4	A.FO.4	A.FO.4	A.FO.4	A.FO.4	A.FO.4
76						
77						
78						
79	G.TR.1	G.TR.1	G.TR.1	G.TR.1	G.TR.1	G.TR.1

Table 7.10
Items Coded by Reviewers to Each Objective
Michigan Grade 7 Mathematics

Low		Medium		High
0		6.967213		52

N																				
N.ME	2	28	65	65	66	66														
N.ME.1	28	28	28																	
N.ME.2	34																			
N.ME.3	34	34	34	34	52															
N.ME.4	42	42	42	42	42	42	52	52	52	52	52									
N.ME.5																				
N.ME.6	15	15	24	24	24	28	28													
N.ME.7	34																			
N.ME.8																				
N.ME.9	15	15	15	15																
N.FL	1	2	3	5	8	19	24	43	43											
N.FL.1	2	11	18	18	18	29	29	29	29	29	29	43	48	58	65	68				
N.FL.2	4	4	4	4	4	7	7	7	7	37	65									
N.FL.3	2	3																		
N.FL.4	1	1	2	2	3	3	3	3	4	5	5	5	5	5	7	7	8	8	11	14
	18	44	46	58	68															
N.FL.5	59	59	59	74	74	74	74													
N.FL.6	23	23	23	23	23	23	41	59	59	59	61	61	61	61	61	61	72	72	72	72
	74																			
N.FL.7	33	33	33	33	33	33	43	44	44	44	55	66	66	66	74					

Table 7.10
Items Coded by Reviewers to Each Objective
Michigan Grade 7 Mathematics

N.FL.8	1	1	1	8	8	8	14	14	14	14	14	18	18	19	19	19	20	20	20	20
	20	20	30	37	41	41	41	41	43	43	44	44	50	56	58	65	65	66	72	
N.MR	11	11	11	11																
N.MR.1																				
N.MR.2	24	24																		
N.MR.3																				
A	63																			
A.PA	49	49																		
A.PA.1	30	30	30	30	30	37	37	37	37	41	50	50	50	50	50					
A.PA.2	67																			
A.FO	26	46	46	67	67	69	69	70	70											
A.FO.1	39	49																		
A.FO.2																				
A.FO.3	22	22	22	22	39	49														
A.FO.4	12	12	12	12	12	13	13	13	13	13	19	19	22	22	26	35	35	35	35	35
	35	38	38	38	38	38	38	39	39	39	39	48	48	48	48	48	49	64	64	
	64	64	68	68	68	68	72	75	75	75	75	75	75							
A.FO.5	69	70																		
A.FO.6	12	13	64																	
A.FO.7	46	69	69	70	70	70														
A.FO.8	26	63	63	63	63	67														
A.FO.9	26	26	26	46	46	64	67	67	69											
A.RP																				

Table 7.10
Items Coded by Reviewers to Each Objective
Michigan Grade 7 Mathematics

A.RP.1																				
A.RP.2	63																			
A.RP.3	17	17	17	17	17	17	21	21	21	21	21	21	27	27	27	27	27			
M	10	27	55	56																
M.UN	10	51																		
M.UN.1	6	6	6	6	40	40	40	40	40	40	51	51	51	51	58	58	58	71	71	71
	71	71	71																	
M.PS	6	6																		
M.PS.1																				
M.TE	55	55	56	56																
M.TE.1																				
G	10	10	51	55	56															
G.GS	10	55	56																	
G.GS.1	10	25	60	60	60	60														
G.GS.2	25	25	25	25	25	47	47	47	47	60	60									
G.TR																				
G.TR.1	45	45	45	45	45	45	47	47	57	57	57	57	57	57	79	79	79	79	79	79
G.TR.2																				
D																				
D.PR	36	36	73																	
D.PR.1	16	16	16	16	36	36	36	36	62	62	73	73	73							
D.PR.2	16	16	62	62	62	62	73	73												

Table 7.11
Number of Reviewers Coding an Item by Objective (Item Number: Number of Reviewers)
Michigan Grade 7 Mathematics

Low		Medium		High
1		4		8

N													
N.ME	2:1	28:1	65:2	66:2									
N.ME.1	28:3												
N.ME.2	34:1												
N.ME.3	34:4	52:1											
N.ME.4	42:6	52:5											
N.ME.5													
N.ME.6	15:2	24:3	28:2										
N.ME.7	34:1												
N.ME.8													
N.ME.9	15:4												
N.FL	1:1	2:1	3:1	5:1	8:1	19:1	24:1	43:2					
N.FL.1	2:1	11:1	18:3	29:6	43:1	48:1	58:1	65:1	68:1				
N.FL.2	4:5	7:4	37:1	65:1									
N.FL.3	2:1	3:1											
N.FL.4	1:2	2:2	3:4	4:1	5:5	7:2	8:2	11:1	14:1	18:1	44:1	46:1	58:1
	68:1												
N.FL.5	59:3	74:4											
N.FL.6	23:6	41:1	59:3	61:6	72:4	74:1							
N.FL.7	33:6	43:1	44:3	55:1	66:3	74:1							
N.F	1:3	8:3	14:5	18:2	19:3	20:6	30:1	37:1	41:4	43:2	44:2	50:1	56:1

Table 7.11
Number of Reviewers Coding an Item by Objective (Item Number: Number of Reviewers)
Michigan Grade 7 Mathematics

L.8													
	58:1	65:2	66:1	72:1									
N.MR	11:4												
N.MR.1													
N.MR.2	24:2												
N.MR.3													
A	63:1												
A.PA	49:2												
A.PA.1	30:5	37:4	41:1	50:5									
A.PA.2	67:1												
A.FO	26:1	46:2	67:2	69:2	70:2								
A.FO.1	39:1	49:1											
A.FO.2													
A.FO.3	22:4	39:1	49:1										
A.FO.4	12:5	13:5	19:2	22:2	26:1	35:6	38:6	39:4	48:5	49:1	64:4	68:4	72:1
	75:6												
A.FO.5	69:1	70:1											
A.FO.6	12:1	13:1	64:1										
A.FO.7	46:1	69:2	70:3										
A.FO.8	26:1	63:4	67:1										
A.FO.9	26:3	46:2	64:1	67:2	69:1								
A.RP													
A.RP.1													
A.R	63:1												

Table 7.11
Number of Reviewers Coding an Item by Objective (Item Number: Number of Reviewers)
Michigan Grade 7 Mathematics

P.2					
A.R P.3	17:6	21:6	27:5		
M	10:1	27:1	55:1	56:1	
M.U N	10:1	51:1			
M.U N.1	6:4	40:6	51:4	58:3	71:6
M.P S	6:2				
M.P S.1					
M.T E	55:2	56:2			
M.T E.1					
G	10:2	51:1	55:1	56:1	
G.G S	10:1	55:1	56:1		
G.G S.1	10:1	25:1	60:4		
G.G S.2	25:5	47:4	60:2		
G.T R					
G.T R.1	45:6	47:2	57:6	79:6	
G.T R.2					
D					
D.P R	36:2	73:1			
D.P R.1	16:4	36:4	62:2	73:3	
D.P R.2	16:2	62:4	73:2		

Table 7.13
Assessment Item DOK vs Consensus DOK (Item Number: Number of Reviewers [Average DOK])
Michigan Grade 7 Mathematics

Low DOK		Matched DOK		High DOK
1		4		8

N [1]:									
N.ME [1]:	2:1[1]	28:1 [1]	65:2 [2]	66:2 [2]					
N.ME.1 [1]:	28:3 [1]								
N.ME.2 [1]:	34:1 [1]								
N.ME.3 [1]:	34:4 [1.25]	52:1 [1]							
N.ME.4 [1]:	42:6 [1.5]	52:5 [1.4]							
N.ME.5 [1]:									
N.ME.6 [1]:	15:2 [1]	24:3 [1]	28:2 [1]						
N.ME.7 [1]:	34:1 [1]								
N.ME.8 [1]:									
N.ME.9 [1]:	15:4 [1]								
N.FL [2]:	1:1[1]	2:1[1]	3:1[1]	5:1[1]	8:1[2]	19:1 [2]	24:1 [1]	43:2 [1.5]	
N.FL.1 [2]:	2:1[1]	11:1 [2]	18:3 [1.67]	29:6 [2]	43:1 [2]	48:1 [2]	58:1 [2]	65:1 [2]	68:1 [1]

Table 7.13
Assessment Item DOK vs Consensus DOK (Item Number: Number of Reviewers [Average DOK])
Michigan Grade 7 Mathematics

N.FL.2 [1]:	4:5[1]	7:4[1]	37:1 [2]	65:1 [2]									
N.FL.3 [1]:	2:1[1]	3:1[1]											
N.FL.4 [1]:	1:2[1]	2:2[1]	3:4[1.75]	4:1[1]	5:5[1.6]	7:2[1]	8:2[2]	11:1 [1]	14:1 [1]	18:1 [2]	44:1 [1]	46:1 [1]	58:1 [2]
	68:1 [2]												
N.FL.5 [1]:	59:3 [1.33]	74:4 [1]											
N.FL.6 [2]:	23:6 [2]	41:1 [2]	59:3 [2]	61:6 [2]	72:4 [2]	74:1 [1]							
N.FL.7 [2]:	33:6 [1.5]	43:1 [2]	44:3 [1.67]	55:1 [1]	66:3 [2]	74:1 [1]							
N.FL.8 [2]:	1:3[1]	8:3[2]	14:5 [1.4]	18:2 [2]	19:3 [2]	20:6 [1.5]	30:1 [1]	37:1 [1]	41:4 [2]	43:2 [2]	44:2 [2]	50:1 [2]	56:1 [1]
	58:1 [2]	65:2 [2]	66:1 [2]	72:1 [2]									
N.MR [1]:	11:4 [1.5]												
N.MR.1 [1]:													
N.MR.2 [2]:	24:2 [1.5]												
N.MR.3 [1]:													
A [2]:	63:1 [2]												
A.PA [2]:	49:2 [2]												
A.P	30:5	37:4	41:1	50:5									

Table 7.13
Assessment Item DOK vs Consensus DOK (Item Number: Number of Reviewers [Average DOK])
Michigan Grade 7 Mathematics

A.1 [2]:	[1.8]	[1.25]	[2]	[1.8]									
A.PA.2 [2]:	67:1 [1]												
A.FO [1]:	26:1 [1]	46:2 [1.5]	67:2 [1]	69:2 [1]	70:2 [1]								
A.FO.1 [1]:	39:1 [2]	49:1 [1]											
A.FO.2 [1]:													
A.FO.3 [1]:	22:4 [1.5]	39:1 [1]	49:1 [2]										
A.FO.4 [2]:	12:5 [1.8]	13:5 [1.8]	19:2 [2]	22:2 [2]	26:1 [2]	35:6 [1.5]	38:6 [1.5]	39:4 [1.25]	48:5 [1.4]	49:1 [2]	64:4 [2]	68:4 [1.75]	72:1 [2]
	75:6 [1.5]												
A.FO.5 [2]:	69:1 [1]	70:1 [1]											
A.FO.6 [2]:	12:1 [2]	13:1 [2]	64:1 [2]										
A.FO.7 [1]:	46:1 [2]	69:2 [2]	70:3 [2]										
A.FO.8 [1]:	26:1 [2]	63:4 [1.75]	67:1 [2]										
A.FO.9 [2]:	26:3 [1]	46:2 [2]	64:1 [2]	67:2 [2]	69:1 [2]								
A.RP [1]:													
A.RP.1 [1]:													

Table 7.13
Assessment Item DOK vs Consensus DOK (Item Number: Number of Reviewers [Average DOK])
Michigan Grade 7 Mathematics

A.RP.2 [2]:	63:1 [2]				
A.RP.3 [1]:	17:6 [1.17]	21:6 [1.17]	27:5 [1.2]		
M [2]:	10:1 [1]	27:1 [1]	55:1 [1]	56:1 [1]	
M.UN [1]:	10:1 [1]	51:1 [2]			
M.UN.1 [1]:	6:4[2]	40:6 [1.17]	51:4 [1.75]	58:3 [1.67]	71:6 [1.5]
M.PS [2]:	6:2[2]				
M.PS.1 [2]:					
M.TE [2]:	55:2 [1.5]	56:2 [1.5]			
M.TE.1 [2]:					
G [2]:	10:2 [1]	51:1 [1]	55:1 [2]	56:1 [1]	
G.GS [2]:	10:1 [1]	55:1 [2]	56:1 [2]		
G.GS.1 [2]:	10:1 [1]	25:1 [2]	60:4 [1.75]		
G.GS.2 [1]:	25:5 [1.2]	47:4 [1]	60:2 [1.5]		
G.TR [2]:					
G.TR.1 [2]:	45:6 [1.33]	47:2 [1]	57:6 [1.5]	79:6 [1.17]	

Table 7.13
Assessment Item DOK vs Consensus DOK (Item Number: Number of Reviewers [Average DOK])
Michigan Grade 7 Mathematics

G.TR.2 [2]:				
D [2]:				
D.PR [2]:	36:2 [1]	73:1 [1]		
D.PR.1 [1]:	16:4 [1.25]	36:4 [1.25]	62:2 [1.5]	73:3 [1.67]
D.PR.2 [2]:	16:2 [1.5]	62:4 [1.5]	73:2 [1]	

Table 8.1
Categorical Concurrence Between Standards and Assessment as Rated by Seven Reviewers
Michigan Grade 8 Mathematics
Number of Assessment Items - 67

Standards			Level by Objective			Hits		Cat. Concurr.
Title	Goals #	Objs #	Level	# of objs by Level	% w/in std by Level	Mean	S.D.	
N - Number & Operations	3	10.29	1 2	1 8	11 88	31.57	2.19	YES
A - Algebra	3	14.29	1 2	3 10	23 76	14	2.27	YES
G - Geometry	2	6.29	1 2	1 4	20 80	12.43	0.73	YES
D - Data & Probability	2	5.57	2 3	3 1	75 25	9.14	0.35	YES
Total	10	36.43	1 2 3	5 25 1	16 80 3	67.14	0.64	

Table 8.2
Depth-of-Knowledge Consistency Between Standards and Assessment as Rated by Seven Reviewers
Michigan Grade 8 Mathematics
Number of Assessment Items - 67

Standards			Hits		Level of Item w.r.t. Standard						DOK Consistency
					% Under		% At		% Above		
Title	Goals #	Objs #	M	S.D.	M	S.D.	M	S.D.	M	S.D.	
N - Number & Operations	3	10.29	31.57	2.19	26	34	71	35	4	15	YES
A - Algebra	3	14.29	14	2.27	28	43	57	46	15	33	YES
G - Geometry	2	6.29	12.43	0.73	35	38	61	39	4	18	YES
D - Data & Probability	2	5.57	9.14	0.35	52	47	48	47	0	0	WEAK
Total	10	36.43	67.14	0.64	33	41	61	42	6	22	

Table 8.3
Range-of-Knowledge Correspondence and Balance of Representation Between Standards and Assessment as Rated by Seven Reviewers
Michigan Grade 8 Mathematics
Number of Assessment Items - 67

Standards			Hits		Range of Objectives				Rng. of Know.	Balance Index				Bal. of Represent.
					# Objs Hit		% of Total			% Hits in Std/Ttl Hits		Index		
Title	Goals #	Objs #	Mean	S.D.	Mean	S.D.	Mean	S.D.		Mean	S.D.	Mean	S.D.	
N - Number & Operations	3	10.29	31.57	2.19	8.86	1.46	86	7	YES	47	3	0.72	0.05	YES
A - Algebra	3	14.29	14	2.27	7.29	2.05	51	13	YES	21	3	0.75	0.02	YES
G - Geometry	2	6.29	12.43	0.73	4.71	0.70	75	8	YES	19	1	0.76	0.06	YES
D - Data & Probability	2	5.57	9.14	0.35	4.71	0.70	85	7	YES	14	1	0.80	0.08	YES
Total	10	36.43	67.14	0.64	6.39	2.23	74	17		25	13	0.76	0.06	

Table 8.4
Summary of Attainment of Acceptable Alignment Level on Four Content Focus Criteria as Rated by Seven Reviewers
Michigan Grade 8 Mathematics
Number of Assessment Items - 67

Standards	Alignment Criteria			
	Categorical Concurrence	Depth-of-Knowledge Consistency	Range of Knowledge	Balance of Representation
N - Number & Operations	YES	YES	YES	YES
A - Algebra	YES	YES	YES	YES
G - Geometry	YES	YES	YES	YES
D - Data & Probability	YES	WEAK	YES	YES

Table 8.5
Source-of-Challenge Issues by Reviewer
Michigan Grade 8 Mathematics

Item Number	Comments by Reviewer
8	Looking at the key I could get the impression that x is a positive value like 1 because the box type is similar. And if I am trying to make both sides equal, I might think that I have to multiply both sides by a -3 instead of just 3.
9	There is not a GLCE for ordered pairs
9	No "ordered pairs" GLCEs
21	I think this is an awful question. There are a lot of ways people interpret representations and interpreting representations takes time.The question is, best illustrates for what reason, or what representation should not be used for percent, or which quantity is incorrectly represented? Students who are in a time-constrained test should not have to answer this question.
30	I am unclear why this question includes the word 'best'? Why shouldn't it just read, "Which question represents 8 squared?"

Table 8.6
Depth-of-Knowledge Levels by Item and Reviewers
Intraclass Correlation
Michigan Grade 8 Mathematics

Item	Rater 1	Rater 2	Rater 3	Rater 4	Rater 5	Rater 6	Rater 7
1	1	1	1	1	1	1	1
2	1	1	1	2	2	1	1
3	1	1	1	2	2	1	1
4	1	1	1	2	2	1	1
5	2	2	2	2	2	1	2
6	1	1	1	1	2	1	2
7	2	2	1	2	2	1	2
8	2	1	2	1	1	2	1
9	1	1	1	1	1	1	1
10	1	1	1	1	1	1	1
11	2	2	2	2	2	2	2
12	2	2	1	1	1	1	2
13	2	1	1	1	1	1	2
14	1	1	1	1	1	1	1
15	2	1	1	1	2	1	2
16	2	2	2	1	1	1	2
17	2	2	2	1	2	2	2
18	2	2	2	2	2	2	3
19	2	2	2	2	2	1	2
20	2	1	1	2	2	1	2
21	2	3	2	2	2	1	2
22	1	1	1	1	1	2	1
23	2	1	1	2	2	1	2
24							
25							
26	1	2	1	2	2	1	2
27	2	2	1	2	2	1	2
28	2	2	2	2	2	2	2
29	2	1	1	1	1	1	2
30	1	1	1	1	1	1	1
31	1	1	1	1	1	1	2
32	2	2	2	2	2	2	2
33	2	2	2	1	1	2	1
34	1	1	2	1	1	2	1
35	2	1	2	2	2	2	2
36	2	2	1	2	2	2	2
37	2	2	1	1	1	1	2
38	2	2	2	2	2	1	2
39	2	2	2	2	2	2	1
40	2	2	2	2	2	2	2

Table 8.6
Depth-of-Knowledge Levels by Item and Reviewers
Intraclass Correlation
Michigan Grade 8 Mathematics

41	2	2	2	2	2	1	2
42	1	2	2	2	2	1	2
43	2	2	2	2	2	1	2
44	2	2	2	2	2	2	2
45	1	2	2	1	1	1	1
46	2	2	2	2	2	1	2
47	2	2	2	2	2	2	2
48	2	2	2	2	2	2	2
49	1	2	1	2	2	2	1
50	1	2	1	1	1	1	1
51							
52							
53	1	1	2	1	1	1	2
54	1	1	1	1	1	1	1
55	2	1	2	1	1	1	1
56	2	2	2	3	3	2	2
57	2	2	1	2	2	1	2
58	2	2	2	2	2	2	2
59	2	1	2	2	2	2	2
60	2	2	1	2	2	1	3
61	2	2	2	2	2	2	2
62	2	2	2	2	2	2	2
63	2	1	2	1	1	1	2
64	2	2	2	2	2	2	2
65	1	2	2	2	2	2	2
66	2	2	2	2	2	2	2
67	2	2	2	2	2	2	2
68	2	2	2	2	2	1	2
69	2	2	2	2	3	1	2
70	2	2	1	2	2	2	2
71	1	2	2	2	2	1	2
72							
73							
74							
75							

Intraclass Correlation: 0.8272
Pairwise Comparison: 0.6901

Table 8.7
Notes by Reviewer
Michigan Grade 8 Mathematics

Item Number	Comments by Reviewer
6	There is no expectation that directly addresses operations on positive rational numbers.
8	modeling of division
11	None of the expectations relates to mean of a set of data.
12	This question is way to easy for the students and they should know this already
13	Way too easy and should not be on a 8th grade test!
15	Way too easy!
26	ignore measure use as known proportion
28	This is not covered in the GLCE's interepreting data tables.
32	There is no reference to the mean in the grade level expectations.
33	This is not culturally correct because many students play video games and none of their video games would be that primative.
39	I wish you would ask a more interesting or challending question for these data.
39	This problem is not social/economical correct, given that most music is in the form of CD's and having several children not have CD's would not make sense, something more generic like pets would be more apperoperiate.
41	This question is not socially/economically correct, because most children would have allowances much larger and it may not make sense to be saving only a quarter a day.
53	Choice C is not understandable. It seems like C could also be a corrent answer.
55	There are no grade-level expectations related to finding the mode.
55	There is nothing in GLCE's on the mode
63	There are no grade level expectations that relate to finding the range of data.

Table 8.8
DOK Levels and Objectives Coded by Each Reviewer
Michigan Grade 8 Mathematics

Item	DOK0	PObj0	S1Obj 0	DOK1	PObj1	S1Obj 1	DOK2	PObj2	S1Obj 2	DOK3	PObj3	S1Obj 3	DOK4	PObj4	S1Obj 4	DOK5	PObj5	S1Obj 5	DOK6	PObj6	S1Obj 6
1	1	N.FL.5		1	A.PA.8		1	A.PA.8		1	A.PA.8		1	A.PA.8		1	N.FL.4		1	N.FL	
2	1	N.FL.4		1	N.FL.4		1	N.FL.5		2	N.FL.4		2	N.FL.4		1	N.FL.4		1	N.FL.4	
3	1	N.FL		1	N.FL		1	N.FL.5		2	N.FL.5		2	N.FL.5		1	N.FL.4		1	N.FL.5	
4	1	N.FL.4		1	N.FL.3		1	N.FL.5		2	N.FL.4		2	N.FL.4		1	N.FL.4		1	N.FL.4	
5	2	N.FL.1		2	N.FL.3		2	N.MR.1		2	N.FL.3		2	N.FL.3		1	N.FL.4		2	N.FL.3	
6	1	N.FL		1	N.FL		1	N.FL.5		1	N.FL.5		2	N.FL.5		1	N.FL.4		2	N.FL.5	
7	2	N.FL.4		2	N.FL.3		1	N.FL.4		2	N.FL.4		2	N.FL.3		1	N.FL.4		2	A.RP.1	
8	2	A.RP.1		1	A.PA		2	A.PA.1		1	A		1	A		2	A.PA.1		1	A.PA	
9	1	A.RP		1	A.RP		1	D		1	A.RP		1	A.RP		1	N.MR		1	A.PA	
10	1	G.TR.1		1	G.TR.1		1	G.TR.1		1	G.TR.1		1	G.TR.1		1	G.TR.1		1	G.TR.1	
11	2	D.RE.1		2	D.AN		2	D.RE.1		2	D.AN.3		2	D.RE.1		2	D.RE		2	D.RE	
12	2	N.FL.4		2	N.FL.3		1	N.FL.4		1	N.FL.4		1	N.FL.4		1	N.FL.4		2	N.FL.4	
13	2	N.FL.3		1	N.FL.3		1	N.FL.4		1	N.FL.4		1	N.FL.4		1	N.FL.4		2	N.FL.1	
14	1	G.TR.2		1	G.TR.1		1	G.TR.2		1	G.TR.1		1	G.TR.1		1	G.TR.1		1	G.TR.1	
15	2	N.FL.3		1	N.FL.4		1	N.FL.4		1	N.FL.4		2	N.FL.4		1	N.FL.4		2	N.FL.5	
16	2	N.FL.3		2	N.FL.2		2	N.FL.2		1	N.FL.2		1	N.FL.2		1	N.FL.2		2	N.FL.1	
17	2	N.FL.6		2	N.FL		2	N.FL.6		1	N.FL.6		2	N.FL.6		2	N.FL.6		2	N.FL.6	
18	2	N.FL.3		2	N.FL.1		2	N.FL.4		2	N.FL.1		2	N.FL.1		2	N.FL.4		3	A.PA.4	
19	2	G.TR.2		2	G.TR.2		2	G.TR.2		2	G.TR.2		2	G.TR.2		1	G.TR.2		2	G.TR.2	
20	2	N.MR.2		1	N.MR.2		1	N.MR.2		2	N.MR.2		2	N.MR.2		1	N.MR.2		2	N.FL	
21	2	D.RE.1		3	D.RE.1		2	D.RE.1		2	D.RE.1		2	D.RE.1		1	D.RE.1		2	D.RE.1	
22	1	A.PA.8		1	A.PA.8		1	A.PA.8		1	A.PA.8		1	A.PA.8		2	A.PA.8		1	A.PA.8	
23	2	N.FL.1		1	N.FL.4		1	N.FL.4		2	N.FL.2		2	N.FL.3		1	N.FL.4		2	N.FL.3	
24																					
25																					
26	1	N.MR		2	N.MR.1		1	N.MR.1		2	N.FL.3		2	N.FL.3		1	N.FL.4		2	N.FL.3	
27	2	A.PA.4		2	A.PA.1		1	N.FL.2		2	A.PA.6		2	A.PA.6		1	A.PA.1		2	A.PA.4	
28	2	D.RE.1		2	D.AN.2		2	D.RE		2	D.AN.2		2	D.AN.2		2	D.AN.2		2	D.AN.2	
29	2	N.FL.1		1	N.FL.4		1	N.FL.5		1	N.FL.4		1	N.FL.4		1	N.FL.5		2	N.FL.4	
30	1	N.ME		1			1	N.MR.2		1	N.MR.2		1	N.MR.2		1	N.FL.4		1	N.MR.2	
31	1	N.FL.4		1	N.FL.5		1	N.FL.5		1	N.FL.4		1	N.FL.4		1	N.FL.5		2	N.ME	
32	2	D.AN.3		2	D.AN.3		2	D.AN.3		2	D.AN.3		2	D.AN.3		2	D.AN.3		2	D.RE.1	
33	2	N.FL.4		2	N.FL.4		2	N.FL.1		1	N.FL.4		1	N.FL.4		2	N.FL.5		1	N.FL.4	
34	1	A.PA.8		1	A.PA.8		2	A.PA.8		1	A.PA.8		1	A.PA.8		2	A.PA.8		1	A.PA.8	
35	2	G.TR.2		1	G.TR.2		2	G.TR.2		2	G.TR.2		2	G.TR.2		2	G.TR.3		2	G.TR.2	
36	2	N.FL.1	N.MR.1	2	N.FL.1		1	N.FL.2		2	N.MR.1		2	N.MR.1		2	N.FL.4		2	N.FL.3	
37	2	N.FL.4		2	N.FL.4		1	N.FL.4		1	N.FL.4		1	N.FL.4		1	N.FL.5		2	N.FL.4	

Table 8.8
DOK Levels and Objectives Coded by Each Reviewer
Michigan Grade 8 Mathematics

38	2	N.ME.1		2	N.FL.2		2	N.MR.1		2	N.MR.2		2	N.MR.1		1	N.FL.2		2	N.MR.1	
39	2	D.RE.1		2	D.RE.1		2	D.RE.1		2	D.RE.1		2	D.RE.1		2	D.RE.1		1	D.RE.1	
40	2	G.TR.1		2	G.TR.1		2	G.TR.2		2	G.TR.1		2	G.TR.1		2	N.FL.3		2	N.FL.3	
41	2	A.PA.6		2	A.PA.4		2	A.PA.6		2	A.PA.6		2	A.PA.6		1	N.FL.4		2	A.PA.2	
42	1	G.TR.2		2	G.TR.2		2	G.TR.2		2	G.TR.1		2	G.TR.1		1	G.TR.2		2	G.TR.1	
43	2	N.FL.1		2	N.FL.2		2	N.FL.2		2	N.FL.2		2	N.FL.2		1	N.FL.2		2	N.FL.1	
44	2	A.PA.3		2	A.PA.6		2	N.FL.2		2	N.FL.2		2	N.FL.2		2	N.FL.3		2	A.PA.6	
45	1	A.PA.8		2	A.FO.2		2	A.PA.8		1	A.PA.8		1	A.PA.8		1	A.PA.8		1	A.PA.8	
46	2	D.AN.2		2	D.AN.2		2	D.AN.2		2	D.AN.2		2	D.AN.2		1	D.AN.2		2	D.AN.2	
47	2	N.FL.3		2	G.TR.2		2	G.TR.2		2	G.TR.2		2	G.TR.2		2	G.TR.2		2	N.FL.3	
48	2	N.FL.6		2	N.FL.6		2	N.FL		2	N.FL.6		2	N.FL.6		2	N.FL.6		2	N	
49	1	A.PA.8		2	N.FL.6		1	N.FL.5		2	A.PA.8		2	A.PA.8		2	A.PA.8		1	A.PA.8	
50	1	N.FL		2	N.FL.4		1	N.FL.5		1	N.FL.4		1	N.FL.4		1	N.FL.5		1	N.FL.5	
51																					
52																					
53	1	G.TR		1	G.TR		2	G.TR		1	G.TR		1	G.TR		1	G.TR		2	G.SR	
54	1	N.FL		1	A.PA.8		1	N.FL.5		1	A.PA.8		1	A.PA.8		1	A.PA.8		1	A.PA.8	
55	2	D.AN		1	D		2	D.AN		1	D.AN		1	D.AN		1	D.AN		1	D.RE.1	
56	2	A.PA.1		2	A.FO.3		2	A.PA.6		3	A.FO.3		3	A.FO.3		2	A.FO.2		2	A.PA.3	
57	2	A.PA.8		2	A.FO.2		1	A.PA.8		2	A.FO.2		2	A.FO.2		1	A.FO.3		2	A.FO.1	
58	2	N.MR.1		2	N.MR.1		2	N.MR.1		2	N.MR.1		2	N.MR.1		2	N.FL.3		2	N.FL.3	
59	2	N.MR.2		1	N.MR.2		2	N.MR.2		2	N.MR.2		2	N.MR.2		2	N.MR.2		2	N.MR.2	
60	2	N.FL.6		2	N.FL.6		1	N.FL.4		2	N.FL.6		2	N.FL.6		1	N.FL.4		3	A.FO.2	
61	2	A.FO.3		2	G		2	G.TR.3		2	A.FO.2		2	A.FO.2		2	G.TR.1		2	A	G
62	2	G.TR.2		2	G.TR.2		2	G.TR.3		2	G.TR.1		2	G.TR.1		2	G.TR.3		2	G.TR.3	
63	2	D.AN.3		1	D.AN		2	D.AN.3		1	D.AN.1		1	D.AN		1	D.AN.3		2	D.RE.1	
64	2	A.PA.5		2	A.PA.6		2	A.PA.6		2	A.RP.1		2	A.RP.1		2	A.PA.6		2	A.PA.6	
65	1	N.MR.1		2	N.MR.1		2	N.FL.2		2	N.MR.1		2	N.MR.1		2	N.FL.2		2	N.FL.2	
66	2	N.FL.3		2	N.FL.3		2	A.PA.4		2	G.TR.1		2	G.TR.1		2	N.FL.3		2	G.TR.2	
67	2	G.TR.4		2	G.TR.4		2	G.TR.3		2	G.TR.4		2	G.TR.4		2	G.TR.4		2	G.TR.4	
68	2	D.AN.3		2	D.AN.3		2	D.AN.3		2	D.AN.3		2	D.AN.3		1	D.AN.3		2	D.AN.3	
69	2	G.TR.4		2	G.TR.4		2	G.TR.4		2	G.TR.4		3	G.TR.4		1	G.TR.4		2	G.TR.2	
70	2	A.PA.1		2	A.RP.1		1	A.PA.1		2	A.RP.1		2	A.RP.1		2	A.PA.6		2	A.PA.2	
71	1	G.TR.4		2	G.TR.4		2	G.TR.4		2	G.TR.4		2	G.TR.4		1	G.TR.4		2	G.TR.1	
72																					
73																					
74																					
75																					

Table 8.8
DOK Levels and Objectives Coded by Each Reviewer
Michigan Grade 8 Mathematics

Pairwise Comparison: 0.4812
Standard Pairwise Comparison: 0.9019

Table 8.9
Objectives Coded to Each Item by Reviewers
Michigan Grade 8 Mathematics

Low		Medium		High
0		6.266667		8

1	N.F L	N.F L.4	N.F L.5	A.P A.8	A.P A.8	A.P A.8	A.P A.8
2	N.F L.4	N.F L.4	N.F L.4	N.F L.4	N.F L.4	N.F L.4	N.F L.5
3	N.F L	N.F L	N.F L.4	N.F L.5	N.F L.5	N.F L.5	N.F L.5
4	N.F L.3	N.F L.4	N.F L.4	N.F L.4	N.F L.4	N.F L.4	N.F L.5
5	N.F L.1	N.F L.3	N.F L.3	N.F L.3	N.F L.3	N.F L.4	N.M R.1
6	N.F L	N.F L	N.F L.4	N.F L.5	N.F L.5	N.F L.5	N.F L.5
7	N.F L.3	N.F L.3	N.F L.4	N.F L.4	N.F L.4	N.F L.4	A.R P.1
8	A	A	A.P A	A.P A	A.P A.1	A.P A.1	A.R P.1
9	N.M R	A.P A	A.R P	A.R P	A.R P	A.R P	D
10	G.T R.1	G.T R.1	G.T R.1	G.T R.1	G.T R.1	G.T R.1	G.T R.1
11	D.R E	D.R E	D.R E.1	D.R E.1	D.R E.1	D.A N	D.A N.3
12	N.F L.3	N.F L.4	N.F L.4	N.F L.4	N.F L.4	N.F L.4	N.F L.4
13	N.F L.1	N.F L.3	N.F L.3	N.F L.4	N.F L.4	N.F L.4	N.F L.4
14	G.T R.1	G.T R.1	G.T R.1	G.T R.1	G.T R.1	G.T R.2	G.T R.2
15	N.F L.3	N.F L.4	N.F L.4	N.F L.4	N.F L.4	N.F L.4	N.F L.5
16	N.F L.1	N.F L.2	N.F L.2	N.F L.2	N.F L.2	N.F L.2	N.F L.3
17	N.F L	N.F L.6	N.F L.6	N.F L.6	N.F L.6	N.F L.6	N.F L.6
18	N.F L.1	N.F L.1	N.F L.1	N.F L.3	N.F L.4	N.F L.4	A.P A.4
19	G.T R.2	G.T R.2	G.T R.2	G.T R.2	G.T R.2	G.T R.2	G.T R.2
20	N.F	N.M	N.M	N.M	N.M	N.M	N.M

Table 8.9
Objectives Coded to Each Item by Reviewers
Michigan Grade 8 Mathematics

	L	R.2	R.2	R.2	R.2	R.2	R.2	
21	D.R E.1	D.R E.1	D.R E.1	D.R E.1	D.R E.1	D.R E.1	D.R E.1	
22	A.P A.8	A.P A.8	A.P A.8	A.P A.8	A.P A.8	A.P A.8	A.P A.8	
23	N.F L.1	N.F L.2	N.F L.3	N.F L.3	N.F L.4	N.F L.4	N.F L.4	
24								
25								
26	N.F L.3	N.F L.3	N.F L.3	N.F L.4	N.M R	N.M R.1	N.M R.1	
27	N.F L.2	A.P A.1	A.P A.1	A.P A.4	A.P A.4	A.P A.6	A.P A.6	
28	D.R E	D.R E.1	D.A N.2	D.A N.2	D.A N.2	D.A N.2	D.A N.2	
29	N.F L.1	N.F L.4	N.F L.4	N.F L.4	N.F L.4	N.F L.5	N.F L.5	
30	N.M E	N.F L.4	N.M R.2	N.M R.2	N.M R.2	N.M R.2		
31	N.M E	N.F L.4	N.F L.4	N.F L.4	N.F L.5	N.F L.5	N.F L.5	
32	D.R E.1	D.A N.3	D.A N.3	D.A N.3	D.A N.3	D.A N.3	D.A N.3	
33	N.F L.1	N.F L.4	N.F L.4	N.F L.4	N.F L.4	N.F L.4	N.F L.5	
34	A.P A.8	A.P A.8	A.P A.8	A.P A.8	A.P A.8	A.P A.8	A.P A.8	
35	G.T R.2	G.T R.2	G.T R.2	G.T R.2	G.T R.2	G.T R.2	G.T R.3	
36	N.F L.1	N.F L.1	N.F L.2	N.F L.3	N.F L.4	N.M R.1	N.M R.1	N.M R.1
37	N.F L.4	N.F L.4	N.F L.4	N.F L.4	N.F L.4	N.F L.4	N.F L.5	
38	N.M E.1	N.F L.2	N.F L.2	N.M R.1	N.M R.1	N.M R.1	N.M R.2	
39	D.R E.1	D.R E.1	D.R E.1	D.R E.1	D.R E.1	D.R E.1	D.R E.1	
40	N.F L.3	N.F L.3	G.T R.1	G.T R.1	G.T R.1	G.T R.1	G.T R.2	
41	N.F L.4	A.P A.2	A.P A.4	A.P A.6	A.P A.6	A.P A.6	A.P A.6	
42	G.T R.1	G.T R.1	G.T R.1	G.T R.2	G.T R.2	G.T R.2	G.T R.2	

Table 8.9
Objectives Coded to Each Item by Reviewers
Michigan Grade 8 Mathematics

43	N.F L.1	N.F L.1	N.F L.2	N.F L.2	N.F L.2	N.F L.2	N.F L.2	
44	N.F L.2	N.F L.2	N.F L.2	N.F L.3	A.P A.3	A.P A.6	A.P A.6	
45	A.P A.8	A.P A.8	A.P A.8	A.P A.8	A.P A.8	A.P A.8	A.F O.2	
46	D.A N.2	D.A N.2	D.A N.2	D.A N.2	D.A N.2	D.A N.2	D.A N.2	
47	N.F L.3	N.F L.3	G.T R.2	G.T R.2	G.T R.2	G.T R.2	G.T R.2	
48	N	N.F L	N.F L.6	N.F L.6	N.F L.6	N.F L.6	N.F L.6	
49	N.F L.5	N.F L.6	A.P A.8	A.P A.8	A.P A.8	A.P A.8	A.P A.8	
50	N.F L	N.F L.4	N.F L.4	N.F L.4	N.F L.5	N.F L.5	N.F L.5	
51								
52								
53	G.S R	G.T R	G.T R	G.T R	G.T R	G.T R	G.T R	
54	N.F L	N.F L.5	A.P A.8	A.P A.8	A.P A.8	A.P A.8	A.P A.8	
55	D	D.R E.1	D.A N	D.A N	D.A N	D.A N	D.A N	
56	A.P A.1	A.P A.3	A.P A.6	A.F O.2	A.F O.3	A.F O.3	A.F O.3	
57	A.P A.8	A.P A.8	A.F O.1	A.F O.2	A.F O.2	A.F O.2	A.F O.3	
58	N.F L.3	N.F L.3	N.M R.1	N.M R.1	N.M R.1	N.M R.1	N.M R.1	
59	N.M R.2	N.M R.2	N.M R.2	N.M R.2	N.M R.2	N.M R.2	N.M R.2	
60	N.F L.4	N.F L.4	N.F L.6	N.F L.6	N.F L.6	N.F L.6	A.F O.2	
61	A	A.F O.2	A.F O.2	A.F O.3	G	G	G.T R.1	G.T R.3
62	G.T R.1	G.T R.1	G.T R.2	G.T R.2	G.T R.3	G.T R.3	G.T R.3	
63	D.R E.1	D.A N	D.A N	D.A N.1	D.A N.3	D.A N.3	D.A N.3	
64	A.P A.5	A.P A.6	A.P A.6	A.P A.6	A.P A.6	A.R P.1	A.R P.1	
65	N.F	N.F	N.F	N.M	N.M	N.M	N.M	

Table 8.9
Objectives Coded to Each Item by Reviewers
Michigan Grade 8 Mathematics

	L.2	L.2	L.2	R.1	R.1	R.1	R.1
66	N.F L.3	N.F L.3	N.F L.3	A.P A.4	G.T R.1	G.T R.1	G.T R.2
67	G.T R.3	G.T R.4	G.T R.4	G.T R.4	G.T R.4	G.T R.4	G.T R.4
68	D.A N.3	D.A N.3	D.A N.3	D.A N.3	D.A N.3	D.A N.3	D.A N.3
69	G.T R.2	G.T R.4	G.T R.4	G.T R.4	G.T R.4	G.T R.4	G.T R.4
70	A.P A.1	A.P A.1	A.P A.2	A.P A.6	A.R P.1	A.R P.1	A.R P.1
71	G.T R.1	G.T R.4	G.T R.4	G.T R.4	G.T R.4	G.T R.4	G.T R.4
72							
73							
74							
75							

Table 8.10
Items Coded by Reviewers to Each Objective
Michigan Grade 8 Mathematics

Low		Medium		High
0		10.21739		66

N	48																			
N.ME	30	31																		
N.ME.1	38																			
N.FL	1	3	3	6	6	17	20	48	50	54										
N.FL.1	5	13	16	18	18	18	23	29	33	36	36	43	43							
N.FL.2	16	16	16	16	16	23	27	36	38	38	43	43	43	43	43	44	44	44	65	65
	65																			
N.FL.3	4	5	5	5	5	7	7	12	13	13	15	16	18	23	23	26	26	26	36	40
	40	44	47	47	58	58	66	66	66											
N.FL.4	1	2	2	2	2	2	2	3	4	4	4	4	4	5	6	7	7	7	7	12
	12	12	12	12	12	13	13	13	13	15	15	15	15	15	18	18	23	23	23	
	26	29	29	29	29	30	31	31	31	33	33	33	33	33	36	37	37	37	37	
	37	37	41	50	50	50	60	60												
N.FL.5	1	2	3	3	3	3	4	6	6	6	6	15	29	29	31	31	31	33	37	49
	50	50	50	54																
N.FL.6	17	17	17	17	17	17	48	48	48	48	48	49	60	60	60	60				
N.MR	9	26																		
N.MR.1	5	26	26	36	36	36	38	38	38	58	58	58	58	58	65	65	65	65		
N.MR.2	20	20	20	20	20	20	30	30	30	30	38	59	59	59	59	59	59	59		
A	8	8	61																	
A.PA	8	8	9																	
A.PA.1	8	8	27	27	56	70	70													
A.PA.2	41	70																		
A.P	44	56																		

Table 8.10
Items Coded by Reviewers to Each Objective
Michigan Grade 8 Mathematics

A.3																				
A.PA.4	18	27	27	41	66															
A.PA.5	64																			
A.PA.6	27	27	41	41	41	41	44	44	56	64	64	64	64	70						
A.PA.7																				
A.PA.8	1	1	1	1	22	22	22	22	22	22	22	34	34	34	34	34	34	34	45	45
	45	45	45	45	49	49	49	49	49	54	54	54	54	54	57	57				
A.RP	9	9	9	9																
A.RP.1	7	8	64	64	70	70	70													
A.RP.2																				
A.FO																				
A.FO.1	57																			
A.FO.2	45	56	57	57	57	60	61	61												
A.FO.3	56	56	56	57	61															
G	61	61																		
G.SR	53																			
G.SR.1																				
G.TR	53	53	53	53	53	53														
G.TR.1	10	10	10	10	10	10	10	14	14	14	14	14	40	40	40	40	42	42	42	61
	62	62	66	66	71															
G.TR.2	14	14	19	19	19	19	19	19	19	35	35	35	35	35	35	40	42	42	42	42
	47	47	47	47	47	62	62	66	69											
G.TR.3	35	61	62	62	62	67														
G.TR.4	67	67	67	67	67	67	69	69	69	69	69	69	71	71	71	71	71	71		

Table 8.10
Items Coded by Reviewers to Each Objective
Michigan Grade 8 Mathematics

D	9	55																		
D.RE	11	11	28																	
D.RE.1	11	11	11	21	21	21	21	21	21	21	28	32	39	39	39	39	39	39	39	55
	63																			
D.AN	11	55	55	55	55	55	63	63												
D.AN.1	63																			
D.AN.2	28	28	28	28	28	46	46	46	46	46	46	46								
D.AN.3	11	32	32	32	32	32	32	63	63	63	68	68	68	68	68	68	68			

Table 8.11
Number of Reviewers Coding an Item by Objective (Item Number: Number of Reviewers)
Michigan Grade 8 Mathematics

Low		Medium		High
1		3		7

N	48:1												
N.ME	30:1	31:1											
N.ME.1	38:1												
N.FL	1:1	3:2	6:2	17:1	20:1	48:1	50:1	54:1					
N.FL.1	5:1	13:1	16:1	18:3	23:1	29:1	33:1	36:2	43:2				
N.FL.2	16:5	23:1	27:1	36:1	38:2	43:5	44:3	65:3					
N.FL.3	4:1	5:4	7:2	12:1	13:2	15:1	16:1	18:1	23:2	26:3	36:1	40:2	44:1
	47:2	58:2	66:3										
N.FL.4	1:1	2:6	3:1	4:5	5:1	6:1	7:4	12:6	13:4	15:5	18:2	23:3	26:1
	29:4	30:1	31:3	33:5	36:1	37:6	41:1	50:3	60:2				
N.FL.5	1:1	2:1	3:4	4:1	6:4	15:1	29:2	31:3	33:1	37:1	49:1	50:3	54:1
N.FL.6	17:6	48:5	49:1	60:4									
N.MR	9:1	26:1											
N.MR.1	5:1	26:2	36:3	38:3	58:5	65:4							
N.MR.2	20:6	30:4	38:1	59:7									
A	8:2	61:1											
A.PA	8:2	9:1											
A.PA.1	8:2	27:2	56:1	70:2									
A.PA.2	41:1	70:1											
A.PA.3	44:1	56:1											
A.PA.4	18:1	27:2	41:1	66:1									
A.P	64:1												

Table 8.11
Number of Reviewers Coding an Item by Objective (Item Number: Number of Reviewers)
Michigan Grade 8 Mathematics

A.5									
A.PA.6	27:2	41:4	44:2	56:1	64:4	70:1			
A.PA.7									
A.PA.8	1:4	22:7	34:7	45:6	49:5	54:5	57:2		
A.RP	9:4								
A.RP.1	7:1	8:1	64:2	70:3					
A.RP.2									
A.FO									
A.FO.1	57:1								
A.FO.2	45:1	56:1	57:3	60:1	61:2				
A.FO.3	56:3	57:1	61:1						
G	61:2								
G.SR	53:1								
G.SR.1									
G.TR	53:6								
G.TR.1	10:7	14:5	40:4	42:3	61:1	62:2	66:2	71:1	
G.TR.2	14:2	19:7	35:6	40:1	42:4	47:5	62:2	66:1	69:1
G.TR.3	35:1	61:1	62:3	67:1					
G.TR.4	67:6	69:6	71:6						
D	9:1	55:1							
D.RE	11:2	28:1							
D.RE.1	11:3	21:7	28:1	32:1	39:7	55:1	63:1		
D.AN	11:1	55:5	63:2						

Table 8.11
Number of Reviewers Coding an Item by Objective (Item Number: Number of Reviewers)
Michigan Grade 8 Mathematics

D.A N.1	63:1			
D.A N.2	28:5	46:7		
D.A N.3	11:1	32:6	63:3	68:7

Low DOK		Matched DOK		High DOK
1		3		7

N [2]:	48:1 [2]												
N.ME [2]:	30:1 [1]	31:1 [2]											
N.ME.1 [2]:	38:1 [2]												
N.FL [2]:	1:1[1]	3:2[1]	6:2[1]	17:1 [2]	20:1 [2]	48:1 [2]	50:1 [1]	54:1 [1]					
N.FL.1 [2]:	5:1[2]	13:1 [2]	16:1 [2]	18:3 [2]	23:1 [2]	29:1 [2]	33:1 [2]	36:2 [2]	43:2 [2]				
N.FL.2 [2]:	16:5 [1.4]	23:1 [2]	27:1 [1]	36:1 [1]	38:2 [1.5]	43:5 [1.8]	44:3 [2]	65:3 [2]					
N.FL.3 [2]:	4:1[1]	5:4[2]	7:2[2]	12:1 [2]	13:2 [1.5]	15:1 [2]	16:1 [2]	18:1 [2]	23:2 [2]	26:3 [2]	36:1 [2]	40:2 [2]	44:1 [2]
	47:2 [2]	58:2 [2]	66:3 [2]										
N.FL.4 [2]:	1:1[1]	2:6[1.33]	3:1[1]	4:5[1.4]	5:1[1]	6:1[1]	7:4[1.5]	12:6 [1.33]	13:4 [1]	15:5 [1.2]	18:2 [2]	23:3 [1]	26:1 [1]
	29:4 [1.25]	30:1 [1]	31:3 [1]	33:5 [1.4]	36:1 [2]	37:6 [1.5]	41:1 [1]	50:3 [1.33]	60:2 [1]				
N.FL.5 [1]:	1:1[1]	2:1[1]	3:4[1.5]	4:1[1]	6:4[1.5]	15:1 [2]	29:2 [1]	31:3 [1]	33:1 [2]	37:1 [1]	49:1 [1]	50:3 [1]	54:1 [1]
N.FL.6 [2]:	17:6 [1.83]	48:5 [2]	49:1 [2]	60:4 [2]									
N.MR [2]:	9:1[1]	26:1 [1]											
N.MR.1 [2]:	5:1[2]	26:2 [1.5]	36:3 [2]	38:3 [2]	58:5 [2]	65:4 [1.75]							

N.MR.2 [2]:	20:6 [1.5]	30:4 [1]	38:1 [2]	59:7 [1.86]			
A [2]:	8:2[1]	61:1 [2]					
A.PA [2]:	8:2[1]	9:1[1]					
A.PA.1 [1]:	8:2[2]	27:2 [1.5]	56:1 [2]	70:2 [1.5]			
A.PA.2 [2]:	41:1 [2]	70:1 [2]					
A.PA.3 [2]:	44:1 [2]	56:1 [2]					
A.PA.4 [2]:	18:1 [3]	27:2 [2]	41:1 [2]	66:1 [2]			
A.PA.5 [2]:	64:1 [2]						
A.PA.6 [2]:	27:2 [2]	41:4 [2]	44:2 [2]	56:1 [2]	64:4 [2]	70:1 [2]	
A.PA.7 [2]:							
A.PA.8 [2]:	1:4[1]	22:7 [1.14]	34:7 [1.29]	45:6 [1.17]	49:5 [1.6]	54:5 [1]	57:2 [1.5]
A.RP [2]:	9:4[1]						
A.RP.1 [2]:	7:1[2]	8:1[2]	64:2 [2]	70:3 [2]			
A.RP.2 [1]:							
A.FO [2]:							
A.F	57:1						

O.1 [1]:	[2]								
A.FO.2 [2]:	45:1 [2]	56:1 [2]	57:3 [2]	60:1 [3]	61:2 [2]				
A.FO.3 [2]:	56:3 [2.67]	57:1 [1]	61:1 [2]						
G [2]:	61:2 [2]								
G.SR [1]:	53:1 [2]								
G.SR.1 [1]:									
G.TR [2]:	53:6 [1.17]								
G.TR.1 [2]:	10:7 [1]	14:5 [1]	40:4 [2]	42:3 [2]	61:1 [2]	62:2 [2]	66:2 [2]	71:1 [2]	
G.TR.2 [2]:	14:2 [1]	19:7 [1.86]	35:6 [1.83]	40:1 [2]	42:4 [1.5]	47:5 [2]	62:2 [2]	66:1 [2]	69:1 [2]
G.TR.3 [2]:	35:1 [2]	61:1 [2]	62:3 [2]	67:1 [2]					
G.TR.4 [2]:	67:6 [2]	69:6 [2]	71:6 [1.67]						
D [2]:	9:1[1]	55:1 [1]							
D.RE [3]:	11:2 [2]	28:1 [2]							
D.RE.1 [3]:	11:3 [2]	21:7 [2]	28:1 [2]	32:1 [2]	39:7 [1.86]	55:1 [1]	63:1 [2]		
D.AN [2]:	11:1 [2]	55:5 [1.4]	63:2 [1]						
D.AN.1 [2]:	63:1 [1]								

D.AN.2 [2]:	28:5 [2]	46:7 [1.86]		
D.AN.3 [2]:	11:1 [2]	32:6 [2]	63:3 [1.67]	68:7 [1.86]