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ABSTRACT

This bulletin presents a description of the general education subtests of the Florida Teacher Certification Examination. Information is provided on: (1) competencies and skills tested in the reading subtest; (2) general subtest and item specifications of the writing tests--methods used in evaluating writing ability and rating rationales for selected writing samples; and (3) development of the specifications for the mathematics subtest--guidelines to the overall design of the test, and item specifications for skills and subskills to be demonstrated in the test. The appendix provides a description of the scoring procedures for the writing subtest. (JD)

The Florida Teacher Certification Examination
Bulletin II : The General Education Subtests – Reading, Writing, Mathematics

State of Florida
Department of Education
Tallahassee, Florida
Ralph D. Turlington, Commissioner
Affirmative action/equal
opportunity employer

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FLORIDA: A STATE OF EDUCATIONAL DISTINCTION. "On a statewide average, educational achievement in the State of Florida will equal that of the upper quartile of states within five years, as indicated by commonly accepted criteria of attainment." Adopted, State Board of Education, Jan. 29, 1981

PREFACE

Four bulletins have been developed to provide information about the Florida Teacher Certification Examination. Bulletin I describes the history and early development of the examination and presents the general specifications for the subtests. It also provides a list of supplemental materials and references concerning the methodology behind each individual subtest, as well as a set of sample items for each test. Bulletin II, this bulletin, presents a general description of the Reading, Writing, and Mathematics Subtests and the item specifications for each subtest. Its appendix provides a detailed description of the scoring procedures for the Writing Subtest. Bulletin III provides a description of the content base and item specifications for each of the professional items in the Teacher Certification Examination. Bulletin IV, the technical manual, describes the technical adequacy of the examination, including such topics as test reliability, test validity, passing scores, and methods of protecting the test from cultural or ethnic bias.

It is expected that faculty members of teacher education programs and students in these programs will be especially interested in Bulletin I. Directors of teacher education centers and school district staff development directors also may find the information useful. The specific item specifications and other information in Bulletins II and III will probably be of special interest to professionals involved in program development and evaluation. Bulletin IV was designed primarily for measurement professionals.

Please note that the scope of the examination is limited to the essential generic competencies which are assessable by a written examination. There has been no attempt to cover all aspects of teacher training. Many important competencies are assessable only by direct observation, and many competencies are specific to the subject matter taught or the developmental level of the students. It also is important to remember that teacher education is dynamic; it must change to reflect and incorporate new research evidence and the wisdom accumulated from experience. For these reasons, even though the examination has been carefully developed and reflects the current state of knowledge and priorities for the general preparation of teachers, the specifications for the examination should not be used as the sole basis for a teacher training program.

The specifications presented in Bulletin II are being used for the 1980-81 examinations. If changes are made in the specifications at some future date, it is anticipated that an updated bulletin will be issued. The materials in this bulletin were developed by contractors working under the direction of the Office of Teacher Education of the Florida Department of Education. The contractors' complete reports are on file in the Office of Teacher Certification.

The Department of Education encourages recommendations for improving the Florida Teacher Certification Examination. Recommendations and inquiries should be addressed to:

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READING SUBTEST

GENERAL SUBTEST DESCRIPTION

a. The Reading Subtest will use the multiple-choice cloze procedure.

b. The test will consist of eight to ten passages of approximately one hundred words, selected from the following sources: (1) textbooks commonly used in required professional education courses, (2) journals and newsletters published by nonspecialized teacher organizations, (3) publications for teachers produced by the State Department of Education, and (4) teacher manuals for tests in common use in Florida.

c. Each passage will have ten words deleted. Deleted words will be nouns, verbs, adjectives or adverbs, not structural words.

d. Examinees will be asked to select the word to fill each deletion from among four choices which are syntactically equivalent but different in meaning.

Subtest: Reading

Competency: 4

Subskills: c, d, e

ITEM SPECIFICATIONS

Statement

Competency: Demonstrate the ability to read, comprehend, and interpret orally and in writing professional material

Subskills: Demonstrate literal reading skills (such as recognizing main idea, details, sequencing, comparison and contrast)

Demonstrate interpretive reading skills (such as predicting outcome, drawing conclusions, making generalizations)

Demonstrate critical reading skills (such as recognition of relevant information, propaganda techniques, and fallacies in reasoning)

GENERAL DESCRIPTION/RATIONALE

Given a passage of written material from which ten lexical (nonstructural) words have been deleted, the examinee will select from four choices the correct word to replace each deleted word.

RATIONALE: Research has demonstrated that a modified cloze (i.e., deletion of only lexical, not structural, words and a forced choice response) correlates highly with more traditional tests of reading comprehension while concentrating on the types of language comprehension skills called for by the first subskill of this competency. The use of this technique also makes it possible to use as test material a sample of the materials which teachers and teacher education students are expected to be able to read (see attached list).

STIMULUS ATTRIBUTES

1. The stimulus is a passage of at least one hundred words selected from the documents included in the Domain of Reading Materials (see Appendix B, Bulletin I). Words are deleted systematically from the passage.

RESPONSE ATTRIBUTES

1. The correct response is the deleted word.

2. Alternatives for each deleted word will be three other words that are syntactically the same but semantically different from it.

2. Procedure for selection of passage:

   a. Prepare a list of all available documents in a category of the Domain and assign each of them a number.

   b. Use a table of random numbers to select a document.

   c. Use a table of random numbers to select a page within the document.

   d. Begin the test passage with the first paragraph that starts on the relevant page and continue until at least one hundred words are counted and the end of a sentence is reached.

   e. If the relevant page does not contain continuous prose material or is otherwise unsatisfactory (e.g., contains long lists of things, formulas, etc.) find the first following page that contains acceptable material and select the test passage from it.

3. Procedure for deletion of words:

   a. Count the number of words in the passage and divide by 10 (N = total words ÷ 10).

   b. Use a table of random numbers to select one word in the last five words of the first ten.

   c. Use a table of random numbers to select one word in each of the remaining sets of ten words.

3. Alternatives must not be systematically different in length from the correct word.

4. Alternatives must be located within the same thousand words on the word list of Thorndike or Carroll as the correct word.

5. Responses should be ordered randomly.

d. Delete from the passage the selected word if it is an adjective, adverb, noun, or verb. If it is not, select the next word forward if it is appropriate. If it is not, move to the word immediately before the originally selected word. In this way, move forward and back until an appropriate word is found.

e. Deleted words should be at least five words apart. If, for example, the ninth word in the first ten words and the second word in the second ten words were selected, it would be necessary to replace the word from the second ten with another equally appropriate one.

SUPPLEMENTARY MATERIALS:
Definition of Domain
of Materials

The Domain of Materials for the Reading Subtest consists of all documents in the following categories:

a. Textbooks for courses commonly required for programs in undergraduate education in accredited teacher training institutions in Florida.

b. Journals and newsletters published by nonspecialized teacher organizations and teachers unions whose membership embraces all K-12 teachers.

c. Documents for teachers in general produced by the State Department of Education.

d. Teacher manuals for tests in common use in Florida.

See Bulletin I for a listing of these materials.

WRITING SUBTEST

GENERAL SUBTEST DESCRIPTION

a. Each examinee will write on one topic, to be selected from two options.

b. All topics will be required to meet these criteria:

1. Self-explanatory (i.e., clearly and explicitly phrased)

2. Defined and limited

3. Familiar to every examinee

4. Stimulating

5. Fresh

6. Of middle emotional ground (i.e., neither too pedestrian nor too sensational)

7. Nonbiased and nonbiasing

c. Essays will be evaluated by teams of specially selected and trained raters using the criteria discussed on pages 13 through 17.

Subtest: Writing

Competency: 2

Subskill: All

ITEM SPECIFICATIONS

Statement

Competency: Demonstrate the ability to write in a logical, easily understood style, with appropriate grammar and sentence structure

Subskills: Use language at the level appropriate to the topic and reader
Comprehend and apply basic mechanics of writing: spelling, capitalization, and punctuation
Comprehend and apply appropriate sentence structure
Comprehend and apply basic techniques for the organization of written material
Comprehend and apply standard English usage in written communication.

GENERAL DESCRIPTION/RATIONALE

Given a choice of at least two topics the examinee will write an essay, letter, or report which will demonstrate the competency and subskills specified. The writing sample will be scored holistically ("general impression marking") by at least three trained and experienced judges. The relationship of this assignment to the subskills is demonstrated in Figure 1.

STIMULUS ATTRIBUTES	RESPONSE ATTRIBUTES
1. The stimulus will be a choice of two topics and instructions to write on one of the topics.	Students will write their response on lined paper which will be provided.
2. The tone of the instruction should be friendly and supportive.	
3. The instructions should specify that the qualities on which the essay is to be judged are those qualities specified in the competency and subskill/statements, NOT on the amount of the information displayed or the nature of the opinion expressed.	
4. The instructions should encourage the examinees to plan and organize their thoughts before beginning to write.	

5. The criteria for the selection of topi s are:

   a. Self-explanatory (i.e., clearly and explicitly phrased)
   b. Defined and limited
   c. Familiar to every examinee
   d. Stimulating
   e. Fresh
   f. Of middle emotional ground (i.e., neither too pedestrian nor too sensational)
   g. Nonbiased and nonbiasing

METHODS OF EVALUATING WRITING ABILITY

The Council on Teacher Education (COTE) recommendations for the Writing Subtest of the Teacher Certification Examination specified that it be a "writing production test that will be rated holistically by selected evaluation experts."

A writing production test is one of two basic methods of obtaining a measure of someone's writing ability. It might be called the "direct" method, in that it involves rating directly a sample of writing. The other--"indirect"--method is to administer an objective test of traits that are ostensibly related to writing ability. Examiners using the indirect approach have sampled such things as knowledge of grammar and usage rules, ability to recognize errors and edit a flawed passage, range of vocabulary, and verbal reasoning ability. Testmakers have presented evidence that a carefully constructed objective test can be a highly valid predictor of writing ability. The conviction still persists, however, especially among teachers of writing, that no test that does not involve the production of writing can really be called a test of writing ability.

Two methods for directly evaluating the quality of essays have been developed--the analytical and the holistic. In the analytical approach, the rater, guided by an essay scale or checklist of essay characteristics, reads an essay as many times as necessary in order to make a judgment of the quality of the essay in regard to each of the characteristics identified on the checklist (e.g., organization, style, vocabulary, mechanics, syntax, spelling, etc.). The rater then awards a number score for each characteristic, with the total of those scores being the grade for the essay. This sort of approach is time-consuming and therefore expensive, and is more appropriate for research and diagnostic purposes or for some specific purpose identified by a checklist of specialized traits, than for a simple assessment of quality. Therefore, for the purpose of the teacher examination, which seeks to assess general writing competency, the holistic method of essay evaluation is used. Raters read an essay and assign a rating for its overall quality, rather than break down the scoring into categories as in the analytical method.

The question that naturally arises is whether different raters will rate an essay the same way, since both the analytical and holistic approaches are subjective. The answer is that there is a high degree of inter-rater reliability: many years of grading essay examinations has demonstrated that when there are multiple readers, if the readers are carefully trained, very high interrater agreement can be obtained. Raters are trained to evaluate the Teacher Certification Examination through use of a detailed set of criteria and an extended period of guided discussion so that they internalize a common set of standards. This means that though raters do not analyze each essay according to traits on a checklist, the evaluative criteria they have internalized function as mental checklists as they rate the examinations.

Rating Criteria

The criteria for rating the Writing Subtest, listed below, were developed to describe characteristics that are widely accepted as indicating competency in writing standard English. These writing criteria include and correlate with the characteristics listed in the COTE Essential Competencies and Subskills in Writing (see Table 1, Bulletin I).

1. Rhetorical Quality

   1.1 Unity: an ordering and interdependence of parts producing a single effect; completeness

   1.2 Focus: concentration on the chosen topic

   1.3 Clarity: lucidity of expression; lack of ambiguity and distortion

   1.4 Sufficiency: appropriate depth and breadth of expression to meet the writer's purposes and the demands of the particular topic

2. Structural and Mechanical Quality

   2.1 Organization: consistent and coherent integration and connection of parts

   2.2 Development: appropriate and sufficient exposition of ideas; use of detail, examples, illustrations, comparison, etc.

   2.3 Paragraph and sentence structure: appropriate form, variety, logic, relatedness of and among structural units

   2.4 Syntax: appropriate ordering of words to convey intended meaning

3. Observance of Conventions in Writing

   3.1 Usage: appropriate use of language features: inflections, tense, agreement, pronouns, modifiers, vocabulary, level of discourse, etc.

   3.2 Spelling, capitalization, punctuation: consistent practice of accepted forms

For purposes of rater training, the criteria have been translated into four operational definitions corresponding to the four levels of writing

competence. The operational definitions for the rating scale are as follows:

1. The essay lacks unity and focus. It is distorted and/or ambiguous, and it fails to treat the topic in sufficient depth and breadth. There is little or no discernible organization and only scant development of ideas, if any at all. The essay betrays only sporadically a sense of paragraph and sentence structure, and it is syntactically slipshod. Usage is irregular and often questionable or wrong. There are serious errors in spelling, capitalization, and punctuation.

2. The essay has some degree of unity and focus, but each could be improved. It is reasonably clear, though not invariably so, and it treats the topic with a marginal degree of sufficiency. The essay reflects some concern for organization and some for development of ideas, but neither is necessarily consistent nor fully realized. The essay reveals some sense, if not full command, of paragraph and sentence structure. It is syntactically bland and at times awkward. Usage is generally accurate, if not consistently so. There are some errors in spelling, capitalization, and punctuation that detract from the essay's effect, if not from its sense.

3. The essay is focussed and unified, and it is clearly if not distinctively written. It gives the topic an adequate though not always thorough treatment. The essay is well organized, and most of the time it develops ideas appropriately and sufficiently. It shows a good grasp of paragraph and sentence structure, and its usage is generally accurate and sensible. Syntactically, it is clear and reliable. There may be a few errors in spelling, capitalization, and punctuation, but they are not serious.

4. The essay is unified, sharply focussed, and distinctively effective. It treats the topic clearly, completely, and in suitable depth and breadth. It is clearly and fully organized, and it develops ideas with consistent appropriateness and thoroughness. The essay reveals an unquestionably firm command of paragraph and sentence structure. Syntactically, it is smooth and often elegant. Usage is uniformly sensible, accurate, and sure. There are very few, if any, errors in spelling, capitalization, and punctuation.

Correlation of Rating Criteria to COTE Competencies

The COTE phrasing of most of the subskill specifications allows a candidate for certification to demonstrate mastery of a subskill either indirectly--by answering a question requiring knowledge of the subskill--or directly by application of that subskill. As we have explained above, the holistic evaluation of a writing production test directly measures the candidate's ability to apply these essential writing skills.

Figure 1 below shows graphically how the criteria that will be used to train the raters correspond to the list of COTE Essential Competencies and Subskills (see Bulletin I). Each of the subskills, it will be seen, is addressed in several of the criteria.

FIGURE 1. Correlating the COTE Writing Competencies with a Criterion-Guided Holistic Rating Procedure

COTE Competencies: Demonstrate the ability to write in a logical, easily understood style with appropriate grammar and sentence structure	RHETORICAL				STRUCTURAL				CONVENTIONAL	
	1.1 Unity	1.2 Focus	1.3 Clarity	1.4 Sufficiency	2.1 Organization	2.2 Development	2.3 Structure	2.4 Syntax	3.1 Usage	3.2 Mechanics
Use language at the level appropriate to the topic and reader			✓	✓						
Comprehend and apply basic mechanics of writing: spelling, capitalization, and punctuation									✓	✓
Comprehend and apply appropriate sentence structure							✓		✓	✓
Comprehend and apply basic techniques for the organization of written material	✓	✓			✓	✓	✓			
Comprehend and apply standard English usage in written communication							✓		✓	✓

Rater Qualifications and Training

Raters for the Writing Subtest of the Florida Certification Examination are carefully selected and must have the following qualifications:

1. Academic Preparation: at least a bachelor's degree with an emphasis in English, writing, and composition.

2. Experience: a minimum of two years' experience in teaching and evaluating writing. Examples of qualifying experiences are: teaching English or language arts in secondary schools, teaching or teaching assistantship for college composition courses, professional copy editing.

Before beginning to rate the writing samples for the examination, raters undergo an intensive training program. During this training program, they discuss standards of rating and will actually rate writing samples. In order to qualify as a rater of the examinations, the potential raters are required to meet vigorous standards of reliability.

Rating the Examination

The procedures for rating the examination are based on Section 6A-4.021 of the Florida State Board of Education Rules. For a detailed explanation of the implementation of these Rules, please see the Appendix at the back of this bulletin.

WRITING SAMPLE

Topic: Should sex education be taught in American public schools? Why or why not?

The subject of sex education in the public schools has been a highly heated arguement. There should be a sex education in public schools for the sense of education.

Many of the sexual problems of society today may be caused by not have a properly educate public in the subject of sex. These problems can be defined by that of illigemate children and by diseases. With sex education you can teach the children in ways of contraception and birth control. Also they can be taught in the detection of diseases such as V.D. and cancer.

The argument used by people against it is that it will make children more aware of sex and then procede to do it at an early age. This is very wrong because children will do it and not think it is wrong and may not do as an experiement. And if the children are all ready doing it then it may stop these unwanted babies and young marriages. If they already are doing sexual actions they might as well be safe about it. There are just a few reasons for it.

In this paper I as the writer am saying that sex education in the public schools should be taught. This is an very important subject and should taught to the young as well as the old. Sex is not something dirty but something done by all things in nature. Sex education is a subject worth learning about.

Ratings: 1, 1, 1
Score: 3

Commentary: This essay does little more than state, repeatedly, the writer's opinion that there should be sex education in the schools. The topic is given insufficient treatment; there is virtually no evidence cited to support the position and no development of any related idea(s). The writer uses paragraphs and sentences, but they are consistently ill conceived. The paper is replete with discordant usage, and there are numerous misspellings.

Scoring: An essay rated "1" by each of three experienced raters. The total score is "3," the sum of the individual ratings. This is a failing examination (see Appendix).

WRITING SAMPLE

Topic: What are the essential characteristics of a good teacher?

Good teachers are essential to our schools. One essential characteristic is for the individual teachers to be interested in teaching children. A second characteristic is for the teacher to have some creative teaching abilities to help the students learn. A final characteristic is for the teacher to be understanding and care about his or her students. These three characteristics are just a few of the many things needed in being a good teacher.

Teachers should be interested in teaching because if they are not, the students should not be expected to be interested in learning. Teachers should like to teach children or they really have no business in the teaching profession. Teachers should want to help students learn what they will be needing throughout the rest of their lives.

Another essential characteristic for good teachers is that they should have some creative teaching abilities. Teachers need to spend much time on thinking how to make work interesting enough so children will want to learn. There are some kinds of work that is hard for teachers to make interesting but for the most part interesting work is essential. Also work can be fun and easy to learn if presented in the correct way.

A final characteristic is for teachers to be understanding and care about the students. Students need praise from teachers as well as from parents and peers. This makes most students feel good about themselves and they will want to work harder for more praise. Teachers should also take time in helping individuals as much as possible with their learning questions or problems.

In summary, teachers play a very important part in the learning process of students. The teachers should want to teach, teach in an interesting way, and care about the students. Teachers need these three characteristics and many more in order to be successful in the teaching of children.

Ratings: 2, 2, 3
Score: 7

Commentary: This essay treats the topic adequately, though not in much depth. It is well organized; it is, in fact, a classic, school-taught, five-paragraph theme, with an introduction, a body, and a conclusion. Syntactically, it is flat and repetitious. Its usage is pedestrian. The paper contains few, if any, errors in spelling, punctuation, and capitalization.

Scoring: An essay rated "2" by two experienced raters and "3" by a third experienced rater. The total score is "7," the sum of the individual ratings. This essay meets the minimum passing score of "6" (see Appendix).

WRITING SAMPLE

Topic: Which person in public life do you most admire and why?

The person I admire most in public life is Billie Jean King because of her involvement and dedication to the women's sports movement. I am a Physical Education Major and can strongly relate to her opinions and ideas concerning women in sports.

She has been a major force in encouraging women to participate and feel good about being active. Starting with the women's professional tennis circuit, she has been a dominant personality to upgrade the prize money. In the early seventies, she and a few other women signed professional contracts for one dollar each. That was a beginning, ever since she has been on the move to increase prize money for women. Repetitious press conferences, exhibitions, endless promotions and long hours filled her days for many years at the start of this movement. Because of her exceptional playing skill and endless promotion, people began to notice that women can do well in sports, and more important to the promoters, that it can be a profitable business. She created the beginning and other women followed her lead. Soon, there was a Women's Professional Tennis Circuit sponsored by Virginia Slims. This provided women with weekly competition against the best players, and at the same time provided them an attractive income.

Through the years television, magazines of all sorts, and other media have covered women's tennis. The bubble has burst, now girls start playing tennis at an early age in hope of becoming another Billie Jean King. Housewives go out on the courts and dream of playing like BJK. She has opened the door for many females to go out and play tennis and feel good about doing it.

Since BJK is an international celebrity, anything she says or does is put in print. She has used her press coverage to support other sports for women. She has made a great deal of money and because of this advantage she has been able to start a magazine and also buy a Women's Professional Softball Team.

(Essay continues. This is an excerpt.)

Ratings: 3, 3, 3
Score: 9

Commentary: This essay is well focussed and unified, and it is clearly though not distinctively written. It is well organized, develops ideas appropriately, and gives the topic sufficient treatment. Its usage is generally accurate, and its syntax is reliable. The essay shows a good grasp of sentence and paragraph structure. There are a few minor errors in punctuation

Scoring: An essay rated "3" by each of three experienced raters. The total score is "9," the sum of the individual ratings. This essay meets the minimum passing score of "6" (see Appendix).

WRITING SAMPLE

Topic: What values do you feel schools should attempt to impart to students?

Schools have long been repositories of social conscience. Regardless of their real impact on students – a subject zealously debated by all sorts of critics – schools are expected to be the chief purveyors of values deemed important by society. While I disagree with much of the conventional dogma of public education, which emphasizes a storybook assortment of virtues, I do feel that schools can and should contribute to the stock of values students acquire. Among the most significant of these are a sense of responsibility and independence, a respect for learning and intellectual achievement, and moral sensitivity.

Self-reliance and a personal code of responsibility are promoted in schools, but more in word than indeed. I'd like to see schools give students greater freedom to do broader, deeper work and hold them accountable for it. Such an effort would in effect countermand the current craze (what better term to describe it?) for basic skills and minimum competencies, which has helped to foster a disdain for excellence and an avoidance of personal challenge. People do not learn to be independent and responsible through exhortation, but rather by practicing independence and responsibility in situations demanding them.

A greater insistence on personal responsibility and independence would bring with it, I think, a deeper respect for learning and intellectual achievement. For too much academic work is motivated by external pay off – grades – leading inevitably to a marketplace view of intellectual ability typified by the frantic scramble of high school seniors for high SAT scores. What has happened to learning for its own sake, to intellectual endeavor spurred by nothing more than the distinctly human joy of using the mind purposefully and vigorously?

(Essay continues. This is an excerpt.)

Ratings: 4, 4, 4
Score: 12

Commentary: This essay is sharply focused, unified, and distinctively effective. It treats the topic clearly, completely, and in suitable depth and breadth. The essay is very well organized and develops ideas appropriately. It has a firm command of paragraph and sentence structure, and it is syntactically smooth and, at times, elegant. Usage is uniformly sensible, accurate, and sure. There are no errors in spelling, capitalization, and punctuation.

Scoring: An essay rated "4" by each of three experienced raters. The total score is "12," the sum of the individual ratings. This essay meets the minimum passing score of "6" (see Appendix).

MATHEMATICS SUBTEST

DEVELOPMENT OF SPECIFICATIONS

The Mathematics Subtest was developed through an iterative process which involved, in addition to the Florida State University project staff, faculty members from twelve colleges and universities, eight public and four private.

The composite review panel included representatives from a variety of areas of specialization including mathematics, tests and measurement, early childhood, science, music, and social studies. (A list of the members of the review team is provided in Bulletin I, Appendix A.)

One of the first of the project's tasks was generating a list of issues which would provide guidelines for the development of the total set of item specifications. This task was completed in three phases: Initial Development, First Review, and Second Review.

Initial Development

The project staff generated a list of fourteen issues which should be considered in the development of the item specifications. These issues were derived from previous research activities conducted by members of the project staff and from the suggestions for writing item specifications in Popham's text on writing test specifications.

First Review

The list of fourteen issues was sent to the reviewers. Each reviewer was asked to indicate his/her agreement or disagreement on each issue, to clarify his/her response on each issue by making appropriate comments, and to suggest other issues.

Second Review

The project staff analyzed the data obtained from the first review of the issues and used this data base to formulate tentative recommendations of specifications which would serve as guidelines for developing the Mathematics Subtest of the Teacher Certification Examination.

The second task was the development of item specifications for the Mathematics Subtest, which was accomplished in six stages: development

of prototype items for the five mathematics subskills, review of the prototype items, analysis of the reviewers' evaluations, writing of the item specifications, review of the item specifications, and revision of the specifications.

Prototype Items

The project staff developed an initial set of forty-six test questions representing the types of problems which could be used to assess the basic mathematics skills of the target population. Each test item was related to one of the following mathematics subskills:

a. Adds, subtracts, multiplies, and divides whole numbers, decimals, and fractions.

b. Demonstrates the meaning and use of fractions and percents.

c. Represents and interprets data using charts, tables, graphs, and maps.

d. Solves measurement problems involving length, area, volume, capacity, weight, time, and temperature, using U.S. customary and metric units.

e. Applies mathematical skills to solve real-world problems.

Review of Prototype Items

The prototype items were distributed to the reviewers along with the list of fourteen issues. The reviewers were asked to evaluate each question according to whether or not a question of that type should be included in the competency test.

Analysis of Prototype Item Data

An analysis of the data pertaining to the prototype items and to the fourteen issues provided the project staff with a basis for constructing a list of fifty specifications for problems which appeared to be appropriate for the assessment program. The fifty specifications were distributed among the five subskills as follows:

a. Compute with whole numbers, decimals and fractions -- twenty-four specifications

b. Meaning and use of fractions and percents -- six specifications

c. Graphs, tables and maps -- two specifications

d. Measurement -- six specifications

e. Problem solving -- twelve specifications

Writing of Specifications

Each item specification was written by a member of the project staff. The stimulus and response attributes of each specification were developed to insure that test questions generated from the specification would be consistent with one of the subskills and to define a level of difficulty appropriate for the target population. In order to insure that every question generated from a given specification would not be essentially the same problem, the attributes were described in such a manner that would allow the test writers to have some flexibility in constructing test questions.

The first draft of each specification was reviewed by a staff member; the specification was revised and then reviewed by two members of the project staff. This internal review process focussed on the following criteria: (a) the attributes should be clearly stated; (b) the sample problem should be consistent with the attributes; (c) the attributes should be consistent with the data obtained from the review process.

Review of Specifications

After a quarter of the item specifications were written, they were submitted to six to eight reviewers. The reviewers were asked to evaluate the specifications with respect to the following criteria: (a) that the attributes should be clearly stated; (b) that the attributes should define a class of problems consistent with the identified subskill; and (c) that the difficulty level should be appropriate for the target population. Each reviewer returned the specifications he or she had reviewed. The consensus of the reviewers' evaluations for forty-seven of the fifty specifications was that the attributes described problems appropriate for the Teacher Certification Examination. In two cases, two reviewers indicated that the problems generated by the specifications would be too difficult. These specifications were revised and submitted to another review team. In both cases, the second review team gave their approval of the specifications. One specification, E-11, was not validated by the reviewers and was therefore deleted, leaving a total of forty-nine specifications.

The item specifications were also reviewed and accepted by Department of Education personnel and by a COTE task force.

Revision of Specifications

Suggestions and comments offered by the various reviewers were generally incorporated into the revision of the specifications. Suggestions that would

have signif'cantly changed the nature of the problems generated by a specification or would have increased the difficulty of the questions are not reflected in the revised specifications, since such changes were the opinions of a single reviewer and not those of a majority of the persons reviewing the same set of specifications. The specifications presented to the reviewers were revised by the project staff to insure consistency in the format of presenting the attributes among the various specifications.

GUIDELINES

Overall Guidelines

Based on the data obtained from the review process, the project staff formulated a set of recommendations pertaining to the overall design of the Mathematics Subtest of the Teacher Certification Examination.

Item Specifications

A total of fifty item specifications was developed by the project staff and was revised in accord with suggestions provided by the various reviewers. Forty-nine of the fifty item specifications were accepted for the Mathematics Subtest.

ITEM SPECIFICATIONS

Statement

a. The Mathematics Subtest will consist of forty multiple-choice items, divided approximately as follows:

Subskills	50% Computation Understanding	50% Real-World/ Problem Solving	Total Number	Percent
(1) Add, subtract, multiply, and divide whole numbers, decimals, and fractions	15	4	19	47.5%
(2) Demonstrate the meaning and use of fractions and percents	3	3	6	15%
(3) Represent and interpret data using charts, tables, graphs, and maps	1	2	3	7.5%
(4) Solve measurement problems involving length, area, volume, capacity, weight, time, and temperature, using U.S. customary and metric units	1	5	6	15%
(5) Apply mathematical skills to solve real-world problems		6	6	15%
Totals	20	20	40	100%

b. Additional Recommendations:

Real-World Items

50% items teacher-related and 50% items consumer-related/problem solving
33% items can be answered by making a "ball park" estimate
16% items will contain extraneous information
30% items will have information presented in a graph, table, or drawing
50% items will involve two or more steps
16% items will be analysis or synthesis tasks

Measurement Items

50% U.S. Customary and 50% metric

At least twelve items distributed across the following measurement topics: length, weight, capacity, area/perimeter/volume, elapsed time

General

36% of the items will have "None of the above" as an option as indicated in the item specification

12% of the items will have "None of the above" as the correct answer (six real-world, six computation/fact/understanding)

Code M5a-1

Skill Basic Mathematics

Subskill Demonstrates an ability to add whole numbers

Item Descriptor Whole number addition: computation

Stimulus Attributes

1. There should be three addends: one 2-digit, one 3-digit, and one 4-digit.
2. The problem should be written in sentence form; the word "sum" should be used.
3. The addends should not be ordered according to the number of digits (not 2, 3, 4, or 4, 3, 2).
4. The problem should require at least two regrouping steps; one of these should be from hundreds to thousands.
5. In selecting the three addends, no digit should be used more than two times.

Response Attributes

1. Format:
   a. Numerical responses should be right justified and arranged in either ascending or descending order.
   b. Commas should be used in all numerical choices exceeding three digits.
2. Four alternative responses:
   a. The correct answer
   b. One foil should reflect a failure to regroup in at least one step.
   c. One foil should reflect an alignment error.
   d. One foil should reflect a single fact error: one digit in the sum should be one more or one less than the correct digit.
3. Another possible response:

   "None of the above" may replace either a or d. When used, this alternative should appear as the fourth choice.

Code	M5a-1a
Skill	Basic Mathematics
Subskill	Demonstrates an ability to add whole numbers
Item Descriptor	Whole number addition: one-step application

Stimulus Attributes

1. The situation should be a common real-world situation presented in short paragraph form.
2. The solution should be the result of one-step addition.
3. There should be three to five addends, using 2- to 5-digit whole numbers, according to the situation. There should be at least one variation in the number of digits in the addends.
4. At least two addition regrouping steps should be necessary.
5. When choosing the addends, no digit should be used more than twice.
6. Extraneous information should appear in this problem.
7. The data may be presented in a table, chart, or drawing. Data to be added should not be presented in a vertical column. A specific instruction such as "See the chart" should appear in the problem statement.

Response Attributes

1. Format:
   a. All numerical choices should be right justified and arranged in either ascending or descending order.
   b. Denominate numbers should be used when appropriate.
2. Four alternative responses:
   a. The correct answer
   b. One foil should reflect the result of using all or part of the extraneous information in addition to or in place of the needed data.
   c. One foil should reflect a computational error--a fact error, an alignment error, or a regrouping error.
   d. One foil should reflect a misinterpretation of the problem; for example, finding the average of the addends.
3. Another possible response:

"None of the above" may replace either a, c, or d as the fourth choice. When used, it must appear in the fourth position.

Code M5n-2

Skill Basic Mathematics

Subskill Demonstrates an ability to subtract whole numbers

Item Descriptor Whole number subtraction: computation

Stimulus Attributes

1. The problem should require the subtraction of a 4-digit whole number from a larger 4- or 5-digit whole number.
2. The problem may be written either horizontally or in sentence form.
3. At least two regrouping steps should be required.
4. Zero should appear in the tens and/or the hundreds place of the minuend.
5. In selecting the numbers, no digit should be used more than twice.

Response Attributes

1. Format:
   a. Numerical choices should be right justified and arranged in either ascending or descending order.
   b. Commas should be used in all numbers exceeding three digits.
2. Four alternative responses:
   a. The correct answer
   b. The result of subtracting the smaller number from the larger in each column
   c. The result of failing to "record" regrouping steps
   d. The result of one fact error--one of the digits in the foil answer should be either 1 or 2 more or less than correct digit
3. Other possible responses:
   a. "None of the above" may replace either a or d. When used, this response should appear as the fourth choice.
   b. The result of adding the two numbers may replace either b, c, or d.

Code	M5a-2a
Skill	Basic Mathematics
Subskill	Demonstrates an ability to subtract whole numbers
Item Descriptor	Whole number subtraction: one-step application

Stimulus Attributes

1. The problem should present a real-world situation which can be solved by a one-step subtraction process.
2. The two numbers involved in the subtraction should each contain from three to six digits.
3. At least one regrouping step should be required in the subtraction process.
4. The answer should be a positive quantity.
5. The problem should contain extraneous information.
6. The data may be presented in a chart or graph; if so, specific instructions, such as "See the chart" should be given.

Response Attributes

1. Format:
   a. All numerical choices should be right justified and arranged in either ascending or descending order.
   b. Commas should be used in all numbers exceeding three digits.
   c. Denominate numbers should be used when applicable.
2. Four alternative responses:
   a. The correct answer
   b. One foil should be the result of using the wrong operation.
   c. One foil should be the result of a misinterpretation of the problem which leads to the use of the wrong data.
   d. One foil should be the result of an error in the subtraction process—a failure to regroup, a fact error, etc.
3. Another possible response:

   Except when data is presented in a graph, "None of the above" may replace either a, b, c, or d. When used, this alternative should appear as the fourth choice.

Code: H5a-3

Skill: Basic Mathematics

Subskill: Demonstrates an ability to multiply whole numbers

Item Descriptor: Whole number multiplication: computation

Stimulus Attributes

1. The problem should require the multiplication of two whole numbers.

2. The problem should be written vertically; instructions may be either "Multiply" or "Find the product." The multiplication sign should appear in the problem.

3. The problem should involve at least two regrouping steps during the multiplication process.

4. The multiplier should be a 3-digit whole number; zero should appear in the tens place.

5. The multiplicand should be either a 3-digit whole number or a 4-digit whole number containing a zero.

6. In selecting the factors, no digit may be used more than twice.

7. The digit appearing in units place in each of the factors should be greater than 5.

Response Attributes

1. Format:

   a. Commas should be used in all numerical choices exceeding 4 digits.

   b. Numerical choices should be right justified and arranged in either ascending or descending order.

2. Four alternative responses:

   a. The correct answer

   b. One foil should reflect a regrouping error. This may be (1) a failure to carry or (2) a procedural error such as using the wrong "carried" number or adding the "carried" number before multiplying.

   c. One foil should reflect an alignment error, a failure to move over 2 places for the second partial product.

   d. One foil should reflect a fact error made when multiplying the units digits.

3. Another possible response:

   "None of the above" may replace either a, b, c, or d. When used, this alternative should appear as the fourth choice.

Code: M5a-3a

Skill: Basic Mathematics

Subskill: Demonstrates an ability to multiply whole numbers

Item Descriptor: Whole number multiplication: one-step application

Stimulus Attributes

1. The problem should present in short paragraph form a real-world situation which requires a one-step multiplication process to obtain the answer.

2. The multiplicand should be a 3-digit whole number with at least two non-zero digits.

3. The multiplier should be a 2-digit whole number with only non-zero digits.

4. The multiplication process should involve at least two regrouping steps.

5. In choosing the factors no digit may be used more than twice.

6. Extraneous information may be included in this problem.

7. All or part of the data may appear in a table or chart. If so, a specific instruction such as "Refer to the chart" should appear in the problem.

Response Attributes

1. Format:

   a. Numerical choices should be right justified and arranged in either ascending or descending order.

   b. Commas should be used in numerical choices exceeding three digits.

   c. Denominate numbers should be used when appropriate.

2. Four alternative responses:

   a. The correct answer

   b. One foil should reflect the result of using the wrong operation.

   c. One foil should reflect a multiplication error, either in alignment or regrouping.

   d. If extraneous information is included in the problem, one foil should reflect the use of either all or part of the information. If the problem does not include extraneous information, the foil should reflect a fact error in units place.

3. Another possible foil:

   "None of the above" may appear as the fourth choice, replacing a, b, c, or d. This choice should appear in the fourth position.

Code M5a-4

Skill Basic Mathematics

Subskill Demonstrates an ability to divide whole numbers

Item Descriptor Whole number division: computation

Stimulus Attributes

1. The problem should require the division of a whole number by another whole number.
2. The problem should be written in sentence form.
3. The dividend should be a 4-digit whole number which is not a multiple of 10 or 100.
4. The divisor should be a 2-digit whole number which is not a multiple of 10.
5. The numbers should be chosen so that the quotient will be a 3-digit number with 0 in either the tens or units place.
6. In selecting the dividend and divisor, no digit may be used more than two times.

Response Attributes

1. Format:
   a. Numerical choices should be right justified and arranged in ascending or descending order.
   b. The remainder should be expressed as a whole number and indicated by the word "remainder."
2. Four alternative responses:
   a. The correct response
   b. The result of omitting the zero in the quotient; the remainder should be correct.
   c. One foil should reflect the correct quotient but with an error in the remainder as follows: if the correct remainder is zero, the foil remainder should be the last partial quotient.
   d. One foil should reflect a failure to subtract, resulting in an incorrect partial quotient.
3. Another possible response:

   "None of the above" may replace either the a, c, or d. This choice should appear in the fourth position.

Code [redacted] M-a-4a

Skill Basic Mathematics

Subskill Demonstrates an ability to divide whole numbers

Item Descriptor Whole number division: one-step application

Stimulus Attributes

1. The problem should present a real-world situation which requires a one-step division process for solution.

2. The divisor should be a 2-digit whole number.

3. The dividend should be a 4- or 5-digit whole number.

4. In selecting the dividend and divisor no digit, except zero, should be used more than twice. Zero may be used three times.

5. The dividend and divisor should be selected so that the quotient has at most three non-zero digits and so that the remainder is zero.

6. Extraneous information may be included in this problem.

7. All or part of the data may appear in a chart or graph. A specific instruction such as "See the chart" should appear in the problem statement.

Response Attributes

1. Format:

   a. All numerical choices should be right justified and arranged in either ascending or descending order.

   b. Commas should be used in numerical choices exceeding three digits.

   c. Denominate numbers should be used when appropriate.

2. Four alternative responses:

   a. The correct answer

   b. One foil should reflect the result of using the wrong operation.

   c. One foil should reflect the result of a mistake in the division process.

   d. If extraneous information is included in the item, one foil should reflect the use of all or part of such information. If there is no extraneous information, the foil should reflect a fact error--in either division or subtraction.

3. Another possible foil:

   "None of the above" may appear as the fourth choice replacing either a, b, c, or d. When used, this alternative must appear in the fourth position.

Code	M5a-5
Skill	Basic Mathematics
Subskill	Demonstrates an ability to add decimals
Item Descriptor	Decimal addition: computation

Stimulus Attributes

1. There should be three addends consisting of: a 3-digit mixed number with one decimal place, a decimal fraction with two decimal places, and a 4-digit mixed number with three decimal places.

2. The problem should be presented in horizontal form. Instructions may vary: "Find the sum" or "Add."

3. The order of the addends should not be according to the number of decimal places.

4. The addition should require at least two regrouping steps: one of the regroupings should be across the decimal point, i.e., from tenths to ones.

5. In choosing the numbers, no digit may be used more than twice.

Response Attributes

1. Format:

   Numerical choices should be aligned according to the decimal point and arranged in either ascending or descending order.

2. Four alternative responses:

   a. The correct answer

   b. The sum obtained by treating the numbers as though they were whole numbers, aligning on the right, adding, and pointing off three decimal places.

   c. One foil should reflect a failure to "carry" during at least one of the regrouping steps.

   d. The result obtained by adding whole numbers and decimal components independently and omitting the fourth (left) digit in the decimal component of the sum.

3. Another possible response:

   "None of the above" may replace a, b, c, or d. This alternative should appear as the fourth choice.

Code M5a-5a

Skill Basic Mathematics

Subskill Demonstrates an ability to add decimals

Item Descriptor Decimal addition: one-step application

Stimulus Attributes

1. The problem should present a real-world situation which requires the addition of decimals.

2. There should be either three or four addends. No more than two of these should have the same number of decimal places. At least one of the addends should be a mixed decimal number.

3. The addition process should require at least two regrouping steps--one of these should be across the decimal point.

4. The numbers chosen should each have no more than five digits.

5. When choosing the addends, no digit should be used more than twice.

6. This problem may contain extraneous information.

7. All or part of the data may appear in a graph or table. If so, specific instructions should be given referring the applicant to the data source.

8. If a chart or graph is used, decimals should be explicitly stated. However, the data should not appear in an aligned fashion, as all in one column aligned by decimal points.

Response Attributes

1. Format:

   a. The choices should be aligned according to the decimal point and arranged in either ascending or descending order.

   b. Denominate numbers should be used when appropriate.

2. Four alternative responses:

   a. The correct answer

   b. One foil should reflect the result of aligning the addends on the right rather than by the decimal point and then pointing off a number of decimal places equal to the number of places in the addend with the greatest number of decimal places.

   c. One foil should reflect the result obtained by adding whole number and decimal components independently and omitting the quantity which should have been "carried."

   d. If the problem contains extraneous information, one foil should reflect the use of either all or part of such information. If not, this foil should reflect either the use of only part of the needed data or the result of a computation error other than that described in c above.

3. Another possible response:

   "None of the above" may appear in the fourth position to replace any of the alternatives.

Code: M5a-6

Skill: Basic Mathematics

Subskill: Demonstrates an ability to subtract decimals

Item Descripto.: Decimal subtraction: computation

Stimulus Attributes

1. The problem should require the subtraction of one mixed decimal number from another mixed decimal number of greater numerical value.
2. The problem should be written in sentence form.
3. The minuend should be a 3-digit mixed decimal number with one decimal place.
4. The subtrahend should be a 4-digit mixed decimal number with two decimal places.
5. At least two regrouping steps should be required, including one from tenths to hundredths.
6. In selecting the stimulus numbers, no digit should be used more than twice.

Response Attributes

1. Format:
   a. All numerical choices should appear as mixed decimals.
   b. Numerical choices should be aligned according to the decimal point and arranged in either ascending or descending order.
2. Four alternative choices:
   a. The correct answer
   b. One foil should reflect a failure to regroup from tenths to hundredths. Instead, the hundredths digit is "brought down."
   c. One foil should reflect the result of treating the quantities as whole numbers, that is subtracting the 3-digit number from the 4-digit number and marking off two decimal places.
   d. One foil should reflect the result of aligning the problem correctly but taking the smaller digit from the larger in each column.
3. Other possible responses:
   a. "None of the above" may replace either a or d. This alternative should appear in the fourth position.
   b. To replace either b, c, or d, the result of bringing down the hundredths digit of the subtrahend and completing the rest of the subtraction correctly except for failure to compensate for one of the other regrouping steps.

Code M5a-6a

Skill Basic Mathematics

Subskill Demonstrates an ability to subtract decimals

Item Descriptor Decimal subtraction; one-step application

Stimulus Attributes

1. The problem should present a real-world situation involving money which requires for its solution a one-step subtraction of decimals.

2. The minuend should be a whole number less than $100 and greater than $10. It should be written as a whole number, not as a mixed decimal (e.g., $32 not $32.00).

3. The subtrahend should be a dollar and cent amount less than the minuend. A digit other than 0 should appear in hundredths place.

4. Sales tax should not be included or considered in this problem.

5. In selecting the stimulus numbers, no digit should be used more than twice.

6. Extraneous information may appear in this problem.

7. All or part of the data may appear in a chart, table, or map. If so, the problem statement must explicitly direct the applicant to the data source.

Response Attributes

1. Format:

   a. All numerical choices should involve both dollars and cents and be expressed in standard form (e.g., $10.33).

   b. Alternatives should be right justified and arranged in either ascending or descending order.

2. Four alternative choices:

   a. The correct answer

   b. The result obtained by subtracting the whole number portion and bringing down the decimal fraction

   c. If extraneous information appears in the problem, one foil should reflect the use of all or part of such information. If extraneous information is not included, then this foil should be the result obtained by not reducing the ones digit in the minuend to reflect a regrouping from ones to tenths.

   d. One foil should be the sum of the stimulus numbers.

3. Another possible foil:

   "None of the above" may replace either a, c, or d. If used, this alternative should appear in the fourth position.

Code M5a-7

Skill Basic Mathematics

Subskill Demonstrates an ability to multiply decimals

Item Descriptor Decimal multiplication: computation

Stimulus Attributes

1. The problem should require the multiplication of two decimal numbers, fractions and/or mixed.

2. The problem should be written in either sentence or horizontal form. If the horizontal form is used, instructions may read "Find the product" or "Multiply."

3. One of the factors should consist of three non-zero digits; the other should have three digits--exactly two of these should be non-zero digits greater than 5.

4. Each of the two factors should have at least one decimal place.

5. There should be no more than four decimal places in the product.

6. At least two regrouping steps should be necessary.

7. In choosing the factors, no digit should be used more than twice.

Response Attributes

1. Format:

   All numerical choices should be aligned according to the decimal point and arranged in either ascending or descending order.

2. Four alternative responses:

   a. The correct answer

   b. One foil should reflect an error in regrouping during multiplication.

   c. One foil should reflect an alignment error during multiplication.

   d. One foil should reflect either (1) the omission of the decimal point or (2) an error in positioning the decimal point.

3. Another possible response:

   "None of the above" may replace either a, b, or c. This choice should appear in the fourth position.

Code M5a-7a

Skill Basic Mathematics

Subskill Demonstrates an ability to multiply decimals

Item Descriptor Decimal multiplication: one-step application

Stimulus Attributes

1. The problem should present in short paragraph form a real-world situation requiring a one-step multiplication of decimals for its solution.

2. It should not be necessary to convert given information to decimals before multiplying. For example, tax and interest rates should not be expressed as percents.

3. At least one of the two factors required for the solution should have at least one decimal place.

4. Each factor used should contain no more than five digits. The multiplier should have no more than two non-zero digits. The multiplicand should have no more than three non-zero digits.

5. There should be no more than four decimal places in the product.

6. At least one regrouping step should be necessary in the multiplication process.

7. When choosing the factors no digit, other than zero, should be used more than twice.

8. Extraneous information may appear in this problem.

9. All or part of the data may appear in a table or graph. If so, a specific instruction such as "See the chart" must be included in the problem statement.

Response Attributes

1. Format:

   a. Alternatives should be aligned according to the decimal point and arranged in either ascending or descending order.

   b. Denominate numbers should be used when applicable.

2. Four alternatives:

   a. The correct answer

   b. One foil should be the result of choosing the wrong operation.

   c. One foil should reflect either (1) the omission of the decimal point or (2) an error in positioning the decimal point. The number of places in the product should be the same as in the factor with the greater number of decimal places.

   d. If extraneous information appears in the problem, one foil should reflect the use of either all or part of that information. If not, this foil should reflect a computational error somewhere in the multiplication process.

3. Another possible response:

   "None of the above" may replace a, b, or d. When used, this alternative should appear as the fourth choice.

Code M5a-8

Skill Basic Mathematics

Subskill Demonstrates an ability to divide decimals

Item Descriptor Decimal division: computation

Stimulus Attributes

1. The problem should require the division of either a mixed decimal number or a whole number by a decimal fraction.

2. The problem may be written either horizontally or in sentence form. If the horizontal form is used, use) not ⟌ to indicate division. Instructions may read "Divide" or "Find the quotient."

3. The dividend should be either a 3-digit whole number or a 3-digit mixed decimal with one decimal place.

4. The divisor should be a 2- or 3-digit decimal fraction with only one non-zero digit.

5. The quotient should have at most one decimal place and the remainder should be zero.

6. When choosing the numbers, no digit should be used more than twice.

Response Attributes

1. Format

   a. There should not be a zero to the left of the decimal point if the number is less than one (e.g., .5 not 0.5).

   b. Commas should be used when the whole number contains more than three digits.

   c. Alternatives should be aligned according to the decimal point and arranged in either ascending or descending order.

2. Four alternative choices:

   a. The correct answer

   b. One foil should be the result of dividing by a whole number rather than a decimal.

   c. One foil should be ten times greater than or one-tenth of the correct answer.

   d. One foil should be the result of switching the places of the dividend and the divisor. The quotient should contain at most three non-zero digits.

3. Another possible response:

   "None of the above" may replace either a, b, c, or d as the fourth choice.

Code: M5a-8a

Skill: Basic Mathematics

Subskill: Demonstrates an ability to divide decimals

Item Descriptor: Decimal division: one-step application

Stimulus Attributes

1. The problem should present in short paragraph form a real-world situation which requires a one-step division process for its solution.

2. The divisor should be either a decimal fraction or a mixed decimal number. It should contain no more than three significant digits and no more than four decimal places.

3. The dividend may be a whole number, decimal fraction, or mixed decimal. It should consist of no more than five digits and contain no more than four significant digits.

4. The divisor and dividend should not have the same number of decimal places.

5. The divisor should not be a factor of 100. Neither should it be such that the problem could easily be solved by a multiplication process, e.g., if the notebooks were 50¢ each, then two could be bought for each dollar.

6. Except for zero, no digit should appear more than twice in the two numbers chosen for this problem.

7. A rounding step may be required; if so, explicit instructions must be given as to how many decimal places. Care should also be taken to avoid rounding an exact answer where the last non-zero digit is 5.

8. This problem may contain extraneous information.

9. A part of all of the data may appear in a chart, table, or graph. If so, instructions should direct the applicant to the data source.

Response Attributes

1. Format:

   a. Alternatives should be aligned according to the decimal point and arranged in either ascending or descending order.

   b. Commas should be used in whole number components exceeding three digits.

   c. Denominate numbers should be used when appropriate.

2. Four alternative responses:

   a. The correct answer

   b. One foil should be the result of using the wrong operation; this may also involve a rounding process (e.g., if subtraction is used, the answer 47.34 might be rounded to 47).

   c. One foil should be the result of misplacing the decimal point by one place, either to the right or the left.

   d. One foil should be the result of reversing the divisor and dividend; this result may reflect a misplacement of the decimal point.

3. Another possible foil:

   "None of the above" may replace either a, c, or d. If used this should be the fourth alternative.

Code	M5a-9
Skill	Basic Mathematics
Subskill	Demonstrates an ability to add fractions
Item Descriptor	Fraction addition: computation

Stimulus Attributes

1. The problem should require the addition of two mixed numbers.

2. The problem should be written vertically. Instructions should read "Find the sum" or "Add."

3. The addends should be two mixed numbers. One of these should be less than 10; the other should be greater than 10 but less than 100.

4. The fractional components of the mixed numbers should be proper fractions expressed in lowest terms. Their denominators should be two different numbers from this list: 2, 3, 4, 5, 6, 8, 9. The denominators should have no common factor other than 1.

5. The sum of the fraction components should be greater than 1.

Response Attributes

1. Format:

   a. All alternatives should be mixed numbers. Fractions should be reduced to lowest terms.

   b. Alternatives should be right justified and arranged in either ascending or descending order.

2. Four alternative choices:

   a. The correct answer

   b. The result of adding the whole numbers correctly but adding the fractions by adding the numerators and denominators separately

   c. The result of adding only the fraction components

   d. The result of performing all the steps correctly except forgetting to add one to the whole number component after changing the improper fraction to a mixed number

3. Other possible responses:

   a. "None of the above" may replace either a, b, c, or d. If used, this choice should appear in the fourth position.

   b. The result of choosing the correct common denominator but using an incorrect procedure to obtain the numerators (e.g., $\frac{1}{3} = \frac{5}{12}$ and $\frac{3}{4} = \frac{6}{12}$ with an answer of $19\frac{11}{12}$. This may replace either c or d.).

Code M5a-9a

Skill Basic Mathematics

Subskill Demonstrates an ability to add fractions

Item Descriptor Fraction addition: one-step application

Stimulus Attributes

1. The problem should present in short paragraph form an everyday situation which requires a one-step addition of fractions for its solution.

2. There should be two or three addends--either fractions or mixed numbers. At least one of the addends should be a mixed number. The value of each addend should be less than 100.

3. The fractional components should be proper fractions expressed in lowest terms. Their denominators should be two or three different numbers from this list: 2, 3, 4, 5, 6, 8, 9, 10.

4. The sum of the fractions should be greater than 1.

5. This problem may contain extraneous information.

6. All or part of the data may be presented in a chart, table, graph, or drawing. However, the mixed numbers needed for the solution must be explicitly stated. No estimation should be required. Additionally, instructions such as "Refer to the graph" must be specifically stated in the problem.

Response Attributes

1. Format:

   a. Alternatives should be fractions or mixed numbers. Fractions should be proper fractions.

   b. Alternatives should be right justified and arranged in either ascending or descending order.

   c. Denominate numbers should be used.

2. Four alternative responses:

   a. The correct answer; the fraction component should be reduced to lowest terms.

   b. One foil should be the result of adding the whole numbers correctly but adding the fractions by adding the numerators and denominators separately. This fraction may or may not be reduced to lowest terms.

   c. One foil should be the result of a wrong operation.

   d. If extraneous information appears in the problem, one foil should reflect the use of all or part of such information. Otherwise, this foil should reflect the result of performing all the steps correctly except forgetting to add to the whole number component after changing the improper fraction to a mixed number.

3. Other possible responses:

   a. Response d may be replaced by the result of choosing the correct common denominator but using an incorrect procedure to obtain the numerators.

   b. "None of the above" may appear in the fourth position replacing either a, c, or d.

Code M5a-10

SKill Basic Mathematics

Subskill Demonstrates an ability to subtract fractions

Item Descriptor Fraction subtraction: computation

Stimulus Attributes

1. The problem should require the subtraction of a mixed number from either a whole or mixed number.

2. The problem should be presented in vertical form. Instructions may be: "Subtract" or "Find the difference."

3. The minuend should be either a whole or a mixed number with a value between 10 and 100.

4. The subtrahend should be a mixed number which is less than the minuend.

5. The subtraction of the fraction should require a regrouping step.

6. The denominator(s) of the chosen fraction(s) should be from this list: 2, 3, 4, 5, 6, 8, 9, 10, 12. If two fractions are used, their denominators should be different numbers from this list.

7. All fractions used should be proper fractions expressed in lowest terms.

Response Attributes

1. Format:

   a. Alternatives should be either fractions or mixed numbers. All fractions should be proper fractions expressed in lowest terms.

   b. Alternatives should be right justified and ordered according to either ascending or descending value.

2. Four alternative responses:

   a. The correct answer

   b. One foil should be the result of a failure to regroup. If the minuend is a whole number, the fraction would be brought down. If the minuend is a mixed number, the L.C.D. would be correctly chosen but the smaller quantity would be subtracted from the larger.

   c. One foil should be the result of a failure to record the regrouping step; the foil would be one greater than the correct answer.

   d. One foil should be the sum of the quantities.

3. Another possible response:

   "None of the above" may be substituted for either a, b, c, or d, in the fourth foil position.

Code M5a-10a

Skill Basic Mathematics

Subskill Demonstrates an ability to subtract fractions

Item Descriptor Fraction subtraction: one-step application

Stimulus Attributes

1. The problem should present in short paragraph form a real-world situation requiring for its solution a one-step subtraction involving fractions.

2. The minuend should be either a whole or a mixed number. Its value should be between 10 and 100.

3. The subtrahend should be a mixed number less than the minuend. This fraction component should be greater than the fraction in the minuend if one exists.

4. The denominators of the fractions chosen should be from this list: 2, 3, 4, 5, 6, 8, 9, 12. If two fractions are used, their denominators should have no common factor other than 1.

5. All fraction components should be proper fractions expressed in lowest terms.

6. Extraneous information may appear in this problem.

7. All or part of the data may appear in a chart, table, or drawing. If so, specific instructions such as "See the drawing" must be included in the problem.

Response Attributes

1. Format:

   a. Alternatives should be either fractions or mixed numbers. All fractions should be proper fractions expressed in lowest terms.

   b. Alternatives should be right justified and ordered according to either ascending or descending value.

   c. Denominate numbers should be used when appropriate.

2. Four alternative choices:

   a. The correct answer

   b. One foil should be the result of a failure to regroup. When the minuend is a whole number, this would result in simply bringing down the subtrahend fraction. When the minuend is a mixed number, this would result in a correct L.C.D. but the smaller quantity would be subtracted from the larger.

   c. One foil should be the result of adding the two quantities.

   d. If extraneous information appears in the problem, one foil should reflect the use of all or part of such data. If not, this foil should be the result of a failure to record the regrouping step--resulting in an answer 1 greater than the correct answer.

3. Another possible response:

   "None of the above" may appear as the fourth choice replacing either a, c, or d. If used, this alternative should appear in the fourth position.

Code	M5a-11
Skill	Basic Mathematics
Subskill	Demonstrates an ability to multiply fractions
Item Descriptor	Fraction multiplication: computation

Stimulus Attributes

1. The problem should require the multiplication of a fraction and a mixed number.

2. The problem should be stated in sentence form; use the word "product."

3. The fraction should have 1 as the numerator and either 2, 3, or 4 as the denominator.

4. The mixed number should be less than 10. Its whole number component should not be evenly divisible by the denominator chosen in 3 above. Its fractional component should have 1 as the numerator and a denominator of either 2, 3, or 4. However, the denominator should not be the same as that chosen in 3 above.

5. The numbers selected should necessitate a reducing or cancellation step (e.g., $\frac{1}{3} \times \frac{33}{4} = \frac{11}{4} = 2\frac{3}{4}$).

Response Attributes

1. Format:

   a. Each alternative should be expressed as either a proper fraction, a whole number, or a mixed number. All fractions should be reduced to lowest terms.

   b. Alternatives should be right justified and arranged according to either ascending or descending order.

2. Four alternative responses:

   a. The correct answer

   b. One foil should reflect the result of multiplying one factor by the reciprocal of the other factor.

   c. One foil should be the whole number plus the product of the two fractions.

   d. One foil should reflect the result of adding the two numbers.

3. Other possible responses:

   a. "None of the above" may replace either a, b, or d.

   b. One foil should reflect an error in changing a mixed number to an improper fraction, or vice versa. This foil may replace b, c, or d. If used this foil should appear in the fourth position.

Code: M5a-11a

Skill: Basic Mathematics

Subskill: Demonstrates an ability to multiply fractions

Item Descriptor: Fraction multiplication: one- or two-step application

Stimulus Attributes

1. The problem should present in short paragraph form a real-world situation which requires the applicant to find a part of a part of a quantity.

2. Two proper fractions should be given.

3. The word names of the fractions should be used in the problem stem.

4. The denominators of the fractions chosen should be two different numbers from the list: 3, 4, 5, 6, 8. One of the fractions may be a unit fraction.

5. The correct answer may be a whole number, a mixed number, or a fraction.

6. The correct answer should not require a rounding process.

7. Extraneous information may appear in the problem.

Response Attributes

1. Format:

   a. The choices should be right-justified and arranged in either ascending or descending order.

   b. Denominate numbers should be used when appropriate.

   c. Fractions appearing in the choices should be proper and reduced to lowest terms.

2. Four alternative responses:

   a. The correct answer

   b. One foil should reflect the result of finding the difference of the two fractions and then multiplying by the whole number.

   c. One foil should be the result of multiplying the whole number by one of the fractions.

   d. If extraneous information appears in the problem one foil should reflect the use of all or part of such information. If not, the foil should be the result of multiplying the whole number by the other fraction.

3. Another possible response:

   "None of the above" may appear in the fourth position replacing either a, b, c, or d.

Code M5a-12

Skill Basic Mathematics

Subskill Demonstrates an ability to divide fractions

Item Descriptor Fraction division: computation

Stimulus Attributes

1. The problem should require the division of a fraction by another fraction.

2. The problem should be written in either horizontal or sentence form. If written in horizontal form, instructions should read "Divide" or "Find the quotient."

3. The divisor and dividend should be proper fractions expressed in lowest terms.

4. The denominators of the fractions should be two different numbers from this list: 3, 6, 7, 8, 9, 12.

5. Neither of the fractions should be a unit fraction.

6. The quotient should be either a fraction or mixed number.

Response Attributes

1. Format:

   Alternatives should be right justified and arranged in either descending or ascending order.

2. Four alternative choices:

   a. The correct answer

   b. One foil should be the result of multiplying the two fractions.

   c. One foil should be the result of multiplying the divisor by the reciprocal of the dividend.

   d. One foil should be the result of finding the L.C.D. of the two fractions and the correct equivalent fractions but then making an error in the computation process.

3. Another possible response:

   "None of the above" may replace either a or d. This alternative should appear in the fourth position.

Code	M3a-13
Skill	Basic Mathematics
Subskill	Demonstrates an ability to add, subtract, multiply, and divide whole numbers, decimals, and fractions
Item Descriptor	Simplifying a mathematical expression using properties of operations

Stimulus Attributes

1. The statement should be symbolic and written horizontally. Instructions should direct the applicant to determine the value of the expression.

2. The problem should be constructed to reflect the application of at least two structural properties (e.g., distributive, associative, inverse).

3. The arithmetic should be simple if structural properties are used, but complicated otherwise (e.g., 3.47 + 1.53 = 5 and $5 \times \frac{1}{5} = 1$).

4. The expression should require the use of at least one pair of parentheses.

Response Attributes

1. Format:

   Numerical answers should be aligned by units place and arranged in either ascending or descending order.

2. Four alternative choices:

   a. The correct answer

   b. One foil should reflect a procedural error involving the parentheses.

   c. One foil should reflect a procedural error involving order of operations.

   d. One foil should reflect a computational error; this may involve a failure to perform one of the steps.

Code M5b-1

Skill Basic Mathematics

Subskill Demonstrates an understanding of the meaning of fractions

Item Descriptor Fraction meaning: order

Stimulus Attributes

1. The problem should ask the applicant to determine which of four fractions has the least or greatest value.

2. The data should be presented in the alternative choices.

3. Denominators of the fractions should be either less than 20, or a multiple of 10 less than or equal to 100, or a multiple (2, 3, 4, 5, or 10) of the denominator of the correct answer.

Response Attributes

1. Format:

   a. All alternatives should be proper fractions expressed in lowest terms.

   b. The alternatives should be right justified.

   c. The alternatives should not be arranged in either ascending or descending order.

2. Four alternative choices:

   a. The correct answer

   b. One foil should be the fraction with the least or greatest value depending on the nature of the question. The correct answer and this foil should have the same numerator.

   c. One foil should have a numerator and a denominator greater (less, than the numerator and the denominator of the correct answer; and either the numerator or the denominator should be a multiple of or a factor of the numerator or denominator in the correct answer.

   d. One foil should have the same denominator as the correct answer but have a greater (smaller) numerator.

Code M3b-1a

Skill Basic Mathematics

Subskill Demonstrates an understanding of the meaning of fractions

Item Descriptor Fraction meaning: model interpretation

Stimulus Attributes

1. This problem should require the applicant to determine which of four partially-shaded figures represents the same fraction. The numeric name of the fraction should not be given.

2. Four figures (circles and/or polygons) should be used. Two similar figures may be used provided that there is an obvious difference in their areas and/or in the orientation of the shaded portions.

3. The figures should be divided into a number of equal parts. Some of these parts should be shaded. The ratio of the number of shaded parts to the total number of divisions will determine the fraction which the figure represents.

4. Selection of figures:

   a. One figure should be the "base" for construction of the other figures. This base figure should represent a proper fraction in lowest terms. Its denominator should be either 3, 4, or 5.

   b. One figure should have the same number of shaded parts as the base figure. The size of the shaded area in this figure should not equal the size of the shaded area in the base figure. This figure may or may not represent the same fraction as the base figure.

   c. One figure should have a number of shaded parts which is a multiple of the number of shaded parts in the base figure. This figure may or may not represent the same fraction.

   d. One figure should have a shaded area equal in size to that in the base figure. It should also have the same number of shaded parts as the base. This figure may or may not represent the same fraction.

5. The figures should be labeled Figure 1, Figure 2, etc. However, they should not be numbered according to 4 a-d.

6. Care should be taken that there should be only one fraction which has equivalent representations.

Response Attributes

1. Format:

   a. Responses should be statements which explicitly state which figures represent the same fraction. Statements which refer to a portion of the figures should read: "Figures _____represent the same fraction."

   b. Responses should be randomly ordered.

2. Four alternatives: one of these will be the correct answer.

   a. One choice should be an explicit statement naming the figures which have an equal number of shaded parts but which do not have shaded areas which are equal in size.

   b. One choice should name the base figure and the figure containing a number of shaded parts which is a multiple of the number of shaded parts in the base figure.

   c. One choice should explicitly name those figures having both an equal number of shaded parts and an equal shaded area.

   d. Each of these figures represents a different fraction.

3. There should be only one choice which is a true statement.

Code M5b-2

Skill Basic Mathematics

Subskill Demonstrates an ability to use fractions

Item Descriptor Fraction use: ratio, one-step

Stimulus Attributes

1. The problem should present in a short paragraph a real-world situation involving ratio.

2. The ratio and one proportionate part should be given. The applicant should be asked to find the amount of the other part.

3. The ratio should consist of 2 whole numbers greater than 1 but less than 10. They should have no common factor other than 1.

4. The number representing the "part" should be a whole number having no more than 5 digits and no more than 3 significant digits.

5. It should not be necessary to perform a rounding process in order to calculate the right answer.

6. Extraneous information may be included in this problem.

Response Attributes

1. Format:

   a. All numerical choices should be right justified and arranged in either ascending or descending order.

   b. Denominate numbers should be used when appropriate.

2. Four alternative responses:

   a. The correct answer

   b. One foil should be the result of reversing the ratio.

   c. One foil should be the result of treating the "part" as a total.

   d. If extraneous information appears in the problem, one foil should reflect the use of all or part of such information. If not, this foil should be the result of treating the "part" as a whole and considering the wrong number from the 2 ratio numbers.

3. Another possible response:

   "None of the above" may appear as the fourth choice replacing either a, b, c, or d.

Code: M5b-3

Skill: Basic Mathematics

Subskill: Demonstrates an understanding of the meaning of percents

Item Descriptor: Percent meaning: equivalence to fractions

Stimulus Attributes

1. The problem should present in short paragraph form a real-world situation which requires the applicant to change a proper fraction to its percent equivalent.

2. Both the numerator and the denominator of the fraction should appear in the problem written in their word names (e.g., four, not 4). The resulting fraction should be in lowest terms.

3. The following fractions should not be used: $\frac{1}{2}$, $\frac{1}{4}$, $\frac{3}{4}$, $\frac{1}{3}$, $\frac{2}{3}$, $\frac{1}{5}$, and $\frac{1}{10}$ or any multiple of $\frac{1}{10}$.

4. If a rounding process is required, the problem stem should state that the answer should be rounded to the nearest tenth of a percent.

5. Extraneous information may appear in this problem.

Response Attributes

1. Format:

   a. All numerical choices should use the percent sign. Fractional percents should be rounded to the nearest tenth of a percent.

   b. Choices should be either right justified or aligned according to the decimal point.

   c. Choices should be arranged in either ascending or descending order.

2. Four alternative choices:

   a. The correct answer

   b. One foil should be the result of converting the fraction to a fraction other than hundredths or incorrectly converting from a decimal to a percent.

   c. One foil should reflect the result of reversing the numerator and the denominator.

   d. If extraneous information appears in the problem, one foil should reflect the use of all or part of such information. If not, the foil may be the result of changing a unit fraction with the correct denominator to a percent.

3. Other possible foils:

   a. Except in a situation where rounding is required, "None of the above" may be used as the fourth alternative to replace either a, c, or d.

   b. Response d may be replaced by the result of using only the numerator of the fraction.

Code M5b-3a

Skill Basic Mathematics

Subskill Demonstrates an understanding of the meaning of percent

Item Descriptor Percent meaning: model interpretation

Stimulus Attributes

1. The problem should be a real-world situation in which the partitioning of a total quantity is depicted in a graph or a drawing.

2. The situation should be presented in short paragraph form and should require an approximate determination of what percent a part is of the whole.

3. The part should be comprised of at most three sections or all but one section.

4. The partitioning of the whole should be such that the percent can be determined by visual observation.

5. The correct answer should be restricted to one of the following percents: 25, 33, 67, 75, or a multiple of 10.

6. Data which would permit an arithmetical computation of the answer should not be provided. However, extraneous information may be included in the problem statement.

7. The problem question should state that only an approximate answer is required.

8. Included in the problem statement there should be an explicit instruction such as "See the graph."

9. The graph or figure should be labeled.

Response Attributes

1. Format:

   a. Alternatives should be written as whole number percents, using the symbol %.

   b. Alternatives should be right justified and arranged in either ascending or descending order.

2. Four alternative choices:

   a. The correct answer

   b. One foil should be the number of sections which comprise the part.

   c. One foil should be the complement of the correct answer.

   d. One foil should require a discrimination with respect to one of the following: 0, 10, 25, 33, 50, 67, 75, 90, 100. The difference between this foil and the correct answer should be at least 5.

3. Another possible response:

   "None of the above" may replace either a, b, c, or d. If used, this alternative should appear in the fourth position.

Code M5b-4

Skill Basic Mathematics

Subskill Demonstrates the ability to use percents

Item Descriptor Percentage: all three cases; one-step

Stimulus Attributes

1. The problem should present a real-world task which involves solving one of the three cases: find percent, percentage, or base.

2. The numbers chosen should be 2- or 3-digit whole numbers which have no common factor other than 1. The number representing the base should not be a factor of 100.

3. Neither the percent involved in the problem nor the computed rate should be less than 1% or greater than 1000%.

4. The problem should require that the answer be rounded to the nearest whole percent or whole number.

5. The last non-zero digit in the computed answer should not be 5.

6. Extraneous information may appear in this problem.

Response Attributes

1. Format:

   a. Denominate numbers should be used when appropriate.

   b. Numerical choices should be right justified and arranged in either ascending or descending order.

2. Four alternative choices:

   a. The correct answer

   b. The result of a misinterpretation of the problem. For example, treating a whole number as a percent or a percent as a whole number (e.g., 75 x .56 = 42). This foil could reflect the omission or misplacement of the decimal point.

   c. The result of rounding incorrectly. For example, rounding the quotient expressed as a decimal to the nearest whole number rather than rounding the percent to the nearest whole number or rounding a whole number to the nearest ten or hundred instead of to the nearest unit.

   d. If extraneous information appears in the problem one foil may reflect the use of all or part of such information. Otherwise, the foil should be the result of a computation error, for example, interchanging the roles of the dividend and divisor in a division problem or performing the wrong operation.

Code [illegible]

Skill Basic Mathematics

Subskill Demonstrates an ability to obtain data from a chart or graph

Item Descriptor Table, graph, etc.: obtain data

Stimulus Attributes

1. The problem should present in short paragraph form a real-world situation which requires the applicant to obtain data from a chart, table, or graph.

2. If a graph is used, it should be either a bar or a line graph.

3. Specific instructions in the problem stem should refer the applicant to the table, chart, or graph.

4. In order to maintain a reasonable level of complexity the range of the table or graph should be from a 4 x 5 grid to an 8 x 10 grid.

5. The table or graph must be clearly labeled, including the ordinate and abscissa.

6. The data sources should be based upon a scale. The scale must be clearly stated—either on the graph or in the label. It should be necessary to use the scale to obtain the correct answer.

7. The data obtained may require interpolation.

8. Extraneous information should be included in this problem.

Response Attributes

1. Format:

   a. Numerical choices should be either right justified or aligned according to the decimal point.

   b. Choices should be ordered according to either ascending or descending value except when the nature of the problem dictates that they should not be ordered.

   c. Denominative numbers should be used when applicable.

   d. Commas should be used in numbers having four or more digits.

2. Four alternative responses:

   a. The correct answer

   b. One foil should be the result of a misinterpretation of the problem.

   c. One foil should reflect an error in using the data source. The foil should be the result of moving one column and/or one row away from the correct solution.

   d. One foil should be the result of an incorrect use of the scale.

Code	M5c-1a
Skill	Basic Mathematics
Subskill	Demonstrates an ability to interpret data from a graph or table
Item Descriptor	Table, graph, etc.: obtain data and solve one- or two-step problem

Stimulus Attributes

1. The problem should present a real-world situation with the data presented in either a graph or a table. The problem statement should be in short paragraph form.

2. The problem should require the determination of data from the graph or table and the utilization of the data.

3. The solution should not require the determination of more than three facts from the graph or table.

4. The solution of the problem should involve one or two computational steps, using the data obtained from the graph or table.

5. Included in the problem statement there should be an explicit instruction such as "See graph."

6. If a graph is used, it may be either a bar, circle, line, or pictograph.

7. To maintain a reasonable level of complexity the range of the table or graph should be from a 4 x 5 grid to an 8 x 12 grid.

8. Data may be presented as whole numbers, decimals, or percents. Each fact should have not more than three significant digits.

9. The graph or table should be labeled.

Response Attributes

1. Format:

   a. The choices should be right justified and ordered by either ascending or descending value.

   b. The numerical answers should be appropriate to the situation presented; denominate numbers should be used when applicable.

   c. The number of significant digits should be consistent with the problem situation.

2. Four alternative choices:

   a. The correct answer

   b. One foil should be the result of obtaining the wrong data.

   c. One foil should result from using the wrong operation, incorrectly performing the correct operation, or failing to complete both steps of a two-step problem.

   d. One foil should be the result of a computational error.

Code	M9d-1
Skill	Basic Mathematics
Subskill	Demonstrates an ability to solve measurement problems
Item Descriptor	Length, capacity, and weight: one-step conversion via multiplication or division

Stimulus Attributes

1. The situation should involve a measurement of weight, capacity, or length. The problem should be stated in sentence or short paragraph form.

2. The problem should require the conversion of either (a) a measurement expressed in terms of two units to its equivalent in terms of the smaller of the units, or (b) a measurement expressed in terms of one unit to its equivalent in terms of two units.

3. Common abbreviations for customary units may be used. Metric units should not be abbreviated.

4. The nature of the conversion should be explicity stated in the problem stem.

5. A one-step conversion should be sufficient to reach the correct solution.

6. If the conversion involves division, the measurement should be selected so that there is no remainder after one decimal place.

7. The measurements should be expressed as whole numbers.

8. A table including the conversion factors for the units involved should be provided.

9. All or part of the data may be presented in a chart or a drawing. If so, specific instructions such as "Refer to the drawing" should appear in the problem statement.

Response Attributes

1. Format:

   a. All choices should be expressed in terms of the unit(s) requested in the problem stem.

   b. Common abbreviations may be used to express U.S. Customary units. Word names should be used for the metric units.

   c. Alternatives should be right justified with respect to each unit and arranged in either ascending or descending order.

2. Four alternative responses:

   a. The correct answer

   b. The result of not utilizing the smaller unit

   c. The result of using the inverse operation in the conversion process

   d. If the units are in the English system, the result of treating the smaller unit as a decimal equivalent (4.5 ft.= 4 ft. 5 in.); if the units are in the metric system, the result of using an incorrect conversion factor

3. Another possible response:

   "None of the above" may replace either a, b, c, or d. T[illegible] alternative should appear as the fourth [illegible].

Code: M'ul-1a

Skill: Basic Mathematics

Subskill: Demonstrates an ability to solve measurement problems

Item Descriptor: Length, capacity, and weight: two units; one-step operation with regrouping, addition or subtraction

Stimulus Attributes

1. The problem should involve finding either the sum or the difference of two measurements. The unit measurements may be either length, weight, or capacity. The problem should be stated in sentence or short paragraph form.

2. Each measurement should be given in terms of two units. These must be reasonably related (e.g., lbs. and oz., not tons and oz.). Metric units should not be abbreviated.

3. Only one conversion step should be necessary to reach the correct solution.

4. A table including the conversion factor needed should be provided.

5. All or part of the data may appear in a chart or drawing. If so, specific instructions such as "See the drawing" must appear in the problem statement.

Response Attributes

1. Format:

   a. The choices should all be in terms of either one or both of the units used in the problem. Metric units should not be abbreviated.

   b. The choices should be right justified with respect to each unit and arranged in either ascending or descending order.

2. Four alternative responses:

   a. The correct answer

   b. The result of using an incorrect conversion factor (e.g., 1 lb. = 10 oz., ans. 11 lbs. 6 oz.)

   c. The result of treating the units as two separate problems; in the subtraction mode, taking the smaller number from the larger; in the case of addition, failing to record or "carry over" during the regrouping process

   d. One foil should be the result of using the inverse operation.

3. Another possible response:

   "None of the above" may appear as the fourth choice replacing either a, b, c, or d. If used, this choice should appear in the fourth position.

Code	M'sl-1b
Skill	Basic Mathematics
Subskill	Demonstrates an ability to solve measurement problems
Item Descriptor	Length, capacity and weight: two-or three-step problem combining operation(s) and conversion(s)

Stimulus Attributes

1. The problem should present in short paragraph form a real-world situation involving a measurement of either capacity, weight, or volume.

2. The problem should be solved by either: (a) one or two operations and one conversion, or (b) one operation and two conversions.

3. The major emphasis of the problem should be upon the conversion process(es). Thus the operational aspects should not involve unduly complicated computation.

4. A table containing the needed conversion factors should be provided.

5. If the problem is intended to require two conversions then the table should not include a direct conversion from one unit to the other (e.g., if the problem requires a conversion from inches to yards, the table should not include 1 yard = 36 inches).

6. The situation may require that the answer be rounded either to the nearest whole number or to one decimal place.

7. The situation may require a "sufficient" whole number answer rather than a mixed number.

Response Attributes

1. Format:

   a. The alternatives should be consistent with the item situation; either whole or mixed denominative numbers should be used.

   b. Choices should be right justified and ordered by either ascending or descending value.

2. Four alternative responses:

   a. The correct answer

   b. One foil should reflect a failure to make the final conversion step.

   c. One foil should reflect either a misinterpretation of the problem or a failure to regard some of the information.

   d. One foil should reflect the use of a wrong operation at some point in the computational processing.

Code M3d-2

Skill Basic Mathematics

Subskill Demonstrates the ability to solve measurement problems

Item Descriptor Area and perimeter: application of formula

Stimulus Attributes

1. The problem should present in a short paragraph a real-world situation which requires the applicant to determine which of three rectangular dimensions will result in the greatest area for the least perimeter.
2. The data should be presented in the alternative choices.
3. Dimensions should be presented as 2-digit whole numbers which are multiples of either 10 or 5.
4. Metric units should not be abbreviated.
5. Dimensions for a square should not be included.

Response Attributes

1. Format:
   a. The dimensions should be presented as "_________ by _________." Units of measurement should be given.
   b. The choices should not be ordered according to area size.
   c. Metric units should not be abbreviated.
2. Four alternative responses:
   a. The correct answer
   b. One foil should present dimensions which result in a perimeter equal to that in the correct answer and an area less than that in the correct answer.
   c. One foil should present dimensions which result in an area equal to that in the correct answer and a perimeter greater than that in the correct answer.
   d. The statement, "The answer cannot be determined from the given information."

Code	M5d-2a
Skill	Basic Mathematics
Subskill	Demonstrates an ability to solve measurement problems
Item Descriptor	Area, perimeter, volume: application of formula and a conversion or one-step problem

Stimulus Attributes

1. The problem should present in short paragraph form a real-world situation which requires the applicant to find the area of a rectangle, the perimeter of a polygon (at most 8 sides) or the volume of a rectangular box in one unit; and to convert the measurement to another unit or solve a one-step problem.

2. The dimensions of the figure should be presented in a drawing. Each dimension should be a 2-digit whole number, except at least one dimension of a volume problem should not be a 2-digit number.

3. The problem stem should contain specific instructions referring the applicant to the drawing. Common abbreviations for customary units may be used. Word names should be used for metric units.

4. The solution of the problem should involve a conversion from a standard unit of measure (e.g., square feet) to another unit of measure (e.g., square yards) or to a nonstandard unit of measure (e.g., seating capacity or gallons of paint).

5. The conversion factor should be presented in the problem stem.

6. The dimensions of the figure should be selected so that the product or sum of the dimensions is not a whole number multiple of the conversion factor.

Response Attributes

1. Format:

   a. All choices should be whole numbers. They should be right justified and arranged in either ascending or descending order.

   b. All choices should be denominate numbers specifying the result of the conversion.

   c. Metric units which appear in the responses should not be abbreviated.

2. Four alternative responses:

   a. The correct answer

   b. One foil should be one more or one less than the correct answer reflecting incorrect rounding in the conversion process.

   c. One foil should be the result of using the wrong formula, for example, finding the perimeter rather than the area and then converting correctly.

   d. One foil should reflect only the application of the formula, for example, finding only the area of the rectangle.

Code: M5d-3

Skill: Basic Mathematics

Subskill: Demonstrates an ability to solve measurement problems

Item Descriptor: Elapsed time

Stimulus Attributes

1. The problem should present in short paragraph form a real-world situation involving the elapsed time between two events.

2. The specification of each event should involve two units of time (e.g., hours and minutes, years and months, weeks and days, or days and hours).

3. Except for a.m. and p.m. abbreviations, units should be written out in the problem stem (e.g., years, not yrs.).

4. The two events should not be specified in the same time cycle as determined by the nature of the problem, for example, 10 a.m. and 2 p.m. would be in different cycles for an hours-minutes problem but in the same cycle for a days-hours problem.

5. The specification of the events should be such that if an applicant elects to use a subtraction process to solve the problem, a regrouping from one unit to another unit will be required.

6. The specifications of the events should be such that the elapsed time should not exceed three time cycles as determined by the nature of the problem.

Response Attributes

1. Format:

   a. All choices should reflect a conventional method of specifying the time of an event in terms of units of time; common abbreviations should be used (e.g., 1:30 p.m., 1 hr. 30 min.).

   b. The numerical components of the choices should be right justified (by units) and arranged either according to time sequence or in ascending order according to length of time.

2. Four alternative responses:

   a. The correct answer

   b. One foil should reflect an independent determination of the difference of each unit, thereby avoiding the regrouping step, for example, finding the difference between hours and the difference between minutes as two independent problems.

   c. One foil should reflect an error in the subtraction process whereby regrouping is avoided by subtracting a smaller number from a larger number.

   d. One foil should reflect a misinterpretation of the problem or a failure to note a precise detail in the statement of the problem.

Code	M5e-1
Skill	Basic Mathematics
Subskill	Applies mathematical skills to solve real-world problems
Item Descriptor	Comparison shopping: best buy

Stimulus Attributes

1. The problem should present in short paragraph form a common task involving comparison shopping.
2. The situation should present a choice between different ways to package a product.
3. The problem should ask the applicant to determine the choice with either the least or the greatest cost per unit.
4. The problem should not ask a question such as "Which is the best buy?" unless "best buy" is explicitly defined in the statement of the problem.
5. The data should be presented in the alternative choices.

Response Attributes

1. Format:
   a. Each choice will provide the following data: the unit (item or measurement), the number of units, and the total cost.
   b. The number of units in the four choices should be different but have a common factor (p) other than 1.
   c. The total costs should be different.
   d. The numerical units and prices should each be right justified.
   e. The alternatives should be arranged randomly.
2. Four alternative responses:
   a. The correct answer, which should not have the common factor (p) as the number of units; if a division process is used, the correct answer should be determined by examining either the first or second digit in the quotient
   b. In one foil the number of units should differ from the number of units in the correct choice by the common factor (p).
   c. In one foil the number of units should be the common factor (p).
   d. In one foil the number of units should be a multiple of the number of units in a, b, or c.

Code M5e-2

Skill Basic Mathematics

Subskill Applies mathematical skills to solve real-world problems

Item Descriptor Sequence of money transactions

Stimulus Attributes

1. The problem should present in short paragraph form a common real-world task which involves a sequence of money transactions.

2. The problem should involve at least two additive transactions and at least two subtractive transactions.

3. One of the subtraction steps should involve a whole number amount written without decimal places (e.g., $75, not $75.00); one should involve a dollar and cents amount (e.g., $396.58).

4. One of the addition steps should involve a whole number amount written without decimal places (e.g., $80); one should be a dollar and cents amount (e.g., $10.57).

5. At no point in the sequence of transactions should the amount be less than zero.

6. If the computational steps are performed in sequential order, each computation should require regrouping in addition or in subtraction.

7. The range of the transactions should be $1 to $1000.

Response Attributes

1. Format:

   a. Alternatives should all be money amounts written in standard form with cents dollars and cents.

   b. Alternatives should be right justified and arranged in either ascending or descending order.

2. Four alternative responses:

   a. The correct response

   b. The result of treating either the subtraction or the addition of whole dollar amounts (or both) as a cents amount

   c. The result of omitting one of the transactions

   d. The result of reversing the transactions, i.e., adding rather than subtracting and vice versa

Code	M5e-3
Skill	Basic Mathematics
Subskill	Applies mathematical skills to solve real-world problems
Item Descriptor	Rate

Stimulus Attributes

1. The problem should present in short paragraph form a real-world task involving a rate-time situation.
2. The product and one component should be given. The task should be to find the missing component.
3. The solution should be reached by a one-step division operation.
4. All data given should be whole numbers.
5. Numbers used should not exceed five digits.
6. The wording should explicitly state that an estimation or approximation is being requested. If appropriate, terminology such as "rounded to the nearest hour" may be used.
7. Neither the decimal .5 nor .50 should appear in the exact answer.

Response Attributes

1. Format:
   a. All choices should be denominate numbers.
   b. Alternatives should be aligned according to the decimal point and arranged in either ascending or descending order.
2. Four alternative responses:
   a. The correct response should be rounded to the nearest whole number.
   b. One foil should be either 10 times or 1/10 the correct answer.
   c. One foil should be the result of the correct operation, but with the positions of dividend and divisor reversed.
   d. One foil should be the result of multiplying the two numbers.

Code M5r-4

Skill Basic Mathematics

Subskill Applies mathematical skills to solve real-world problems

Item Descriptor Average

Stimulus Attributes

1. The problem should present in short paragraph form a real-world situation which requires the applicant to find the average of a group of whole numbers.

2. Either four or five numbers may be used. One of these should be repeated. Zero may be used once--if appropriate--as it is in grades.

3. The numbers chosen should be consistent with a realistic situation. If data refers to measurements of length, weight, etc., no conversions should be required to find the average.

4. The numbers chosen should not exceed 3 digits, nor should all the numbers be 1-digit numbers.

5. Regrouping should be required at least once during the addition.

6. The average of the numbers should not be a whole number.

7. The problem should require that the average be rounded to the nearest whole number.

8. The decimal part of the quotient should not be .5, .50, etc.

Response Attributes

1. Format:

   a. The alternatives should be right justified and arranged in either ascending or descending order.

2. Four alternative choices:

   a. The correct answer

   b. One foil should be the result of rounding incorrectly. If the correct answer has been rounded down, then the foil will be one greater. If the correct answer has been rounded up, then the foil will be one less.

   c. One foil should reflect the result of using all the addends to obtain the sum but using a divisor which is one less than the correct divisor.

   d. The result of a failure to carry during the addition

3. None of the foils should correspond to either the median or the mode.

Code M5c-5

Skill Basic Mathematics

Subskill Applies mathematical skills to solve real-world problems

Item Descriptor Ratio: two-step

Stimulus Attributes

1. The problem should present in short paragraph form a real-world situation involving ratio.

2. The ratio and the "total" quantity should be given. The problem should be the determination of one of the two parts.

3. The ratio should be expressed "_____ to _____."

4. The numbers used to express the ratio should be between 1 and 10. They should have no common factor other than 1.

5. The larger of the two ratio numbers should appear first.

6. The number chosen to represent the total quantity should be a multiple of the sum of the ratio numbers and a multiple of at least one of the ratio numbers. The number of digits in this number may range from 2 to 4.

Response Attributes

1. Format:

   a. The alternatives should be whole numbers.

   b. Choices should be right justified and arranged in either ascending or descending order.

   c. Denominate numbers should be used when applicable.

2. Four alternative choices:

   a. The correct answer

   b. One foil should represent the "other part."

   c. The result of treating the ratio as a fractional part of the whole

   d. The result of performing only part of the necessary computation

3. Other possible foils:

   a. "None of the above" may appear as the fourth alternative, replacing d.

   b. The result of dividing the total by one of the ratio numbers

Code M5e-6

Skill Basic Mathematics

Subskill Applies mathematical skills to solve real-world problems

Item Descriptor Scale drawing

Stimulus Attributes

1. The problem should present in short paragraph form a real-world situation which requires the interpretation of a scale drawing.

2. The data should appear in a scale drawing--a map, blueprint, or plot.

3. The applicant should be asked to determine an approximate measurement when given the scale and the drawing.

4. The measurement called for need not be a "straight-line" distance; it may involve a sum (of as many as three measurements), or a difference.

5. A fraction (either ½ or ¼) should be involved in the solution of the problem. Either the measurement should not be an exact multiple of the scale unit or the unit of the scale should be a fraction (e.g., ½" = 10 miles).

6. The scale should be clearly presented. The unit of the scale should be shown with its corresponding value below it as:

   ⟝⟞

   1 cm = 10 meters.

7. The problem stem should contain specific instructions to refer to the drawing.

Response Attributes

1. Format:

   a. All numerical choices should be right justified and arranged in either ascending or descending order.

   b. Denominate numbers should be used when appropriate.

2. Four alternative responses:

   a. The correct answer

   b. One foil should be the result of using the wrong dimension(s).

   c. One foil should be the result of using the wrong scale.

   d. One foil should reflect a computational error.

Code M5e-7

Skill Basic Mathematics

Subskill Applies mathematical skills to solve real-world problems

Item Descriptor Purchasing with multiple orders

Stimulus Attributes

1. The problem should present in short paragraph form a real-world situation involving the purchasing of several items, some of which are multiple quantities.

2. Two of the purchases should be multiple orders.

3. The problem should require no more than four computational steps for its solution.

4. There should be no more than a total of three nonzero digits in both factors in each of the two required multiplication steps.

5. Some or all of the data may be presented in a chart. If so, the problem stem should specifically direct the applicant to the data source.

6. This problem may contain extraneous information.

7. This problem may require an approximate answer.

Response Attributes

1. Format:

   a. All choices should be money amounts aligned by the decimal point and arranged in either ascending or descending order.

   b. Commas should be used in all dollar amounts exceeding three digits.

2. Four alternative responses:

   a. The correct answer

   b. One foil should be a dollar amount corresponding to the total number of items ordered.

   c. One foil should be the result of failing to include a single item order.

   d. If extraneous information appears in the stem, one foil should reflect the use of all or part of such information. If not, this foil may be the sum of the money amounts appearing in the stem.

3. Another possible foil:

   Either b, c, or d may be replaced by the result of associating the wrong quantity numbers with the prices.

Code M5e-8

Skill Basic Mathematics

Subskill Applies mathematical skills to solve real-world problems

Item Descriptor Percent: two-step problem

Stimulus Attributes

1. The problem should present in short paragraph form a real-world situation which requires the applicant to determine either (a) the percent of increase or decrease which reflects a difference between two given quantities or (b) the result when a given percent of increase or decrease is applied to a given base quantity.

2. The percent involved should be less than 1000% and should be a whole number percent.

3. The numbers should be chosen so that the result of the multiplication or division process contains no more than three nonzero digits.

4. This problem may involve a rounding process. If so, the stem must explicitly state how the answer is to be rounded, to the nearest dollar, tenth, etc.

5. If a rounding step is required, care should be taken that the last non-zero digit in an exact answer not be the digit 5.

6. All or part of the data may appear in a chart or table. If so, a statement in the problem should explicitly direct the applicant to the data source.

Response Attributes

1. Format:

   a. Alternatives should either be right justified or aligned by the decimal point.

   b. Choices should be arranged in either ascending or descending order.

   c. Denominate numbers should be used when appropriate.

   d. Commas should be used in whole number amounts having four or more digits.

2. Four alternative responses for case a:

   a. The correct answer

   b. One foil should reflect the result of using the wrong quantity as the base.

   c. One foil should be the difference between the given quantities.

   d. One foil should be the result of dividing one of the given quantities by the other.

3. Four alternative responses for case b:

   a. The correct answer

   b. One foil should be the amount of increase or decrease.

   c. One foil should reflect the result of either treating the percent as a whole number or misplacing the decimal point when converting to a decimal.

   d. One foil should be the result of dividing the base by the percent; this may also reflect an error in the placement of the decimal point.

4. If rounding is called for in the problem stem, the correct answer and the foils should reflect the correct rounding process.

Code	M5a-9
Skill	Basic Mathematics
Subskill	Applies mathematical skills to solve real-world problems
Item Descriptor	Visualizing the solution to a problem which satisfies a specific condition

Stimulus Attributes

1. The problem should present in short paragraph form a real-world situation for which there are several possible solutions to the basic task; however, only one of these solutions would satisfy a given requirement.

2. The computation involved in the solution should be minimal.

3. A drawing or figure which would serve as a model for formulating a solution to the problem should be provided. A specific statement in the problem stem should direct the applicant to the drawing.

4. The problem should contain extraneous information.

Response Attributes

1. Format:

   a. The choices should be right justified and arranged in either ascending or descending order.

   b. Denominate numbers should be used when appropriate.

2. Four alternative answers:

   a. The correct answer

   b. One foil should reflect the result of using all or part of the extraneous data.

   c. One foil should reflect a solution to the problem which does not satisfy the specific requirement.

   d. One foil should reflect a common incorrect approach to solving the problem.

Code M'ac-10

Skill Basic Mathematics

Subskill Applies mathematical skills to solve real-world problems

Item Descriptor Substitution in a formula

Stimulus Attributes

1. The problem should present in short paragraph form a real-world situation involving the application of a formula.

2. The problem should be solely the solving of the formula. No further conversions or computations should be required.

3. The formula and the values of all variables, except for the unknown, should be given.

4. If a geometric formula is used, a drawing of the figure with the appropriate labels should be given.

5. The unknown variable should be isolated on the left side of the equality sign.

6. At least two but no more than four computational steps should be involved in the solution.

7. The formula should be such that either parentheses or exponential notation is necessary to indicate a multiplicative step.

8. The exponents 2 and 3 may appear in the formula as powers of numbers less than 11.

9. All the variables involved should be whole numbers.

10. The constants (parameters) may be fractions, decimals, or whole numbers. If π is involved, its value should be indicated as 3.14.

11. No rounding process should be necessary in the computation.

Response Attributes

1. Format:

   a. All numerical choices should be right justified and arranged in either ascending or descending order.

   b. Denominate numbers should be used when appropriate.

   c. Commas should be used in all whole numbers exceeding three digits.

2. Four alternative responses:

   a. The correct answer

   b. One foil should reflect a procedure error relating to the misuse of either the parentheses or the exponent.

   c. One foil should reflect a computational error.

   d. One foil should reflect a substitution error.

Code: M9a-12

Skill: Basic Mathematics

Subskill: Applies mathematical skills to solve real-world problems

Item Descriptor: Comparison shopping: alternate pricing

Stimulus Attributes

1. The problem should present in short paragraph form a real-world situation involving an item which can be purchased either by price per unit measure (weight, length, volume) or by a multiple number of items.

2. The problem should be one of the following types:

    a. The item's price should be given for one way of purchasing the item (either price per number of units or price per unit measure). The problem should ask for the comparable price in the other way of pricing.

    b. Both ways of stating the price are given and the problem is to determine which is the more economical buy.

3. There should be one conversion involved, for example, ounces to pounds or milliliters to kiloliters.

4. A table containing the needed conversion factors should be provided.

Response Attributes

1. Format:

    a. Numerical alternatives should be right justified and arranged in either ascending or descending order.

    b. Denominate numbers should be used when applicable.

2. Four alternatives for Stimulus 2:

    a. The correct answer

    b. One foil should reflect the result of a reasoning error.

    c. One foil should be the approximate cost of a single unit.

    d. One foil should be the result of a computation error.

3. Four alternatives for Stimulus 3, any one of which may be the correct answer:

    a. One alternative

    b. The other alternative offered in the problem

    c. "The two prices are equivalent."

    d. "Cannot be determined from the given information."

4. If a reasonable approximation is called for, the foils should be such that the difference between each foil and the correct answer is large enough to prevent confusion of the choices.

APPENDIX

PROCEDURES FOR RATING THE WRITING SUBTEST

The procedures for rating the Writing Subtest of the Florida Teacher Certification Examination are based on Section 6A-4.021 of the Florida State Board of Education Rules (SBER), which incorporate certain recommendations made by the Council on Teacher Education. Section 6A-4.021 includes the following statement.

> Acceptable performance on the Writing Subtest shall be a total score of six (6) or more based on the summed ratings of three (3) trained judges using a scale of one (1) for unsatisfactory to four (4) for outstanding. At least two (2) of the three (3) judges must agree on the acceptability of the writing sample by giving it a rating of either 2, 3, or 4. Each judge shall independently evaluate each writing sample and judge it to be acceptable or unacceptable. In the event one (1) rating is more than two (2) points different from another, the writing sample will be rated by a referee and the referee's rating will replace the more discrepant of the original ratings.

Implementation of this Rule is based on two general principles. The first stems from the need to define the Rules' designation that the "referee's rating will replace the most discrepant of the original ratings." The guiding principle here is that maximum score reliability should be sought and maintained through the scoring procedures. Hence, the consistency of a group of scores is always maintained. A referee's divergent rating is never substituted for either of the ratings in a cluster.[1] In the case of serial ratings (e.g., 1-2-3), where ratings are equidistant and it is unknown which score is "discrepant," the referee's rating is used to form a cluster. If the referee's rating is identical with one of the initial ratings, it creates a new cluster. By so doing, it identifies the rating furthest from this new cluster as the one that is most discrepant and replaces it. In cases where the referee's rating does <u>not</u> form a new cluster, that is, does not form a reliable group, the process is repeated until reliability is attained (see I and II below).

The second principle guiding the implementation of the State Rules is that of giving the benefit of any doubt to the examinee. Accordingly, in a score which contains a series rating (1-2-3 or 2-3-4), if the referee's rating agrees with the middle rating, it is used to replace the lower rather than the higher of the original ratings so that the examinee receives a higher score (see Ib and IIb). Furthermore, all papers that received an initial score of 5 will be sent to a referee and be rescored (see IV).

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[1] A cluster is defined as two scores which are either identical or differ by only one point. For example, in the ratings 1-2-4, the 1-2 scores form a cluster.

The scoring procedures for resolution of discrepancies are explained in detail below.

I. Papers whose original ratings are 1-2-3 (discrepancy within a series) will be refereed and scored as follows:

   a. A referee's rating of 1 replaces the 3, resulting in a failing score of 4.

   b. A referee's rating of 2 replaces the 1, resulting in a passing score of 7.

   c. A referee's rating of 3 replaces the 1, resulting in a passing score of 8.

   d. If the referee rates the paper a 4, it will be reread and rated by a new team.

II. Papers whose original ratings are 2-3-4 (discrepancy within a series) will be refereed and scored as follows:

   a. A referee's rating of 2 replaces the 4, resulting in a passing score of 7.

   b. A referee's rating of 3 replaces the 2, resulting in a passing score of 10.

   c. A referee's rating of 4 replaces the 2, resulting in a passing score of 11.

   d. If the referee rates the paper a 1, it will be reread and rated by a new team.

III. In the following cases that include discrepant scores, both before and after being rated by a referee, all the original ratings will be discarded and the writing sample read by a new team of raters.

Original Ratings	Referee Rating
1 1 3	3 or 4
3 3 1	1
1 1 4	3 or 4
4 4 1	1 or 2

IV. All initial scores of 5 will be refereed. If a paper is rated 2-2-1 and the referee rates it a 2, it passes with a 6. If it is refereed as a 1, it fails with a total score of 4. If it is refereed with a 3 or 4, it will be rerated by a new team. A paper which has a score of 5 after being refereed will not be rescored, e.g., a 4-2-1 refereed with a 2 will not be rescored.

V. If any paper is refereed and results in a rating set still containing a discrepancy or series, it will be rescored by a new team of raters and the process repeated until until consistency is obtained.