2016–2017 NC Final Exam of Discrete Mathematics
North Carolina Assessment Specifications

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Purpose of the Assessments

☐ NC Final Exams were developed to replace locally developed assessments, providing teachers and principals with a common measure for all students state-wide during a given testing window. NC Final Exam scores (along with any other relevant end-of-course or end-of-grade assessment scores) will be used in the Educational Value Added Assessment System (EVAAS) to produce student growth measures.

☐ North Carolina's Final Exam for Discrete Mathematics measures students' academic progress in the 2003 North Carolina *Standard Course of Study*.

☐ NC State Board of Education *Policy Delineating Use of State-Designated Assessments for the North Carolina Teacher Evaluation* Process directs schools to use the results from all course-specific NC Final Exams as a minimum of 20% of the student's final course grade.

☐ NC Final Exams will not be used for school and district accountability under the READY Accountability Model or for Federal reporting purposes.

Developing Assessments

☐ North Carolina educators were recruited and trained to write new items for the NC Final Exams. The diversity among the item writers and their knowledge of the current standards was addressed during recruitment. Trained North Carolina educators also review items and suggest improvements, if necessary. The use of North Carolina educators to develop and review items strengthens the instructional validity of the items.

☐ For an in-depth explanation of the test development process see State Board Policy *Delineating Test Development Process for Multiple-Choice Tests* or reference the *Test Development Process: Item, Selection and Form Development* (Updated May 2016).

Curriculum and Assessment Cycle

☐ 2003: North Carolina State Board of Education adoption of the *Standard Course of Study*.

☐ 2012–13: Operational administration of the Measures of Student Learning: Common Exams.

☐ 2013–14: Redesign and subsequent first operational administration of the NC Final Exams.

☐ 2014–15: Second operational administration of the NC Final Exams.

☐ 2015–16: Third operational administration of the NC Final Exams.

☐ 2016–17: Fourth operational administration of the NC Final Exams.

Prioritization of Standards
☐ Members of the Test Development section of the North Carolina Department of Public Instruction (NCDPI) invited teachers to collaborate and develop recommendations for a prioritization of the standards indicating the relative importance of each standard, the anticipated instructional time, and the appropriateness of the standard for multiple-choice item format.

☐ Table 1 describes the range of total items that will appear on the NC Final Exam of Discrete Mathematics. The exam will consist of only multiple-choice items. Each item is worth one point.

*Table 1. Test Specification Weights for the **Discrete Mathematics** NC Final Exam*

2003 *Standard Course of Study*	Range of Total Items
1.01	16% to 24%
1.02	8% to 16%
2.01	14% to 22%
2.02	19% to 27%
2.03	16% to 24%
3.01	9% to 16%
Total	100%

Cognitive Rigor
The Discrete Mathematics items were aligned to the content standards using Marzano's *Thinking Skill Levels*.

Types of Items and Supplemental Materials
☐ The NC Final Exam of Discrete Mathematics consists of four-response-option multiple-choice items.

☐ A complete list of the supplemental test materials (i.e., *NC Final Exams Materials List*) may be reviewed at the NCDPI/Accountability Services website. Students must be provided a graphing calculator and a state-provided formula sheet. Students taking math NC Final Exams must be provided with graph paper and blank paper.

☐ Released items are available on the NCDPI/Accountability Services website. Released items may be used by school systems to help acquaint students with items. The released items may not reflect the breadth of the standards assessed and/or the range of item difficulty found on the NC Final Exam. These materials must not be used for personal or financial gain. The released items are also available to schools through NCTest, the NCDPI's online assessment platform.

☐ Schools must ensure every student participating in an online assessment for the North Carolina Testing Program completes the Online Assessment Tutorial for the associated assessment at least once at the school before test day. The tutorial provides students the opportunity to practice the mechanics of navigating through the testing platform, to become familiar with the tools, and to respond to the sample items. Refer to the *North Carolina Test Coordinators' Policies and Procedures Handbook* (PDF pages 14, 42, 103) for additional information.

Testing Structure and Test Administration Time

☐ The NC Final Exam of Discrete Mathematics contains a total of 37 multiple-choice items. Included in the total item counts are embedded multiple-choice field test items that will not count toward the students score but will be used for purposes of developing items for future test forms.

NC Final Exam 2016-17	Number of Operational Items	Number of Field Test Items*	Total Number of Items
Discrete Mathematics	33 multiple-choice	4 multiple-choice	37

*Field test items will not count toward the students score but will be used for purposes of developing items for future test forms.

☐ Students will be given 120 minutes to answer all items.

☐ Appendix A shows the number of operational items for each standard for the 2016–17 tests. Note that future coverage of standards could vary within the constraints of the test specification weights in *Table 1*.

Test Cycle and Delivery Mode

☐ The NC Final Exams are administered to students enrolled in fall and spring courses. A list of course codes that align with the 2016–17 NC Final Exams (i.e., *Course Codes that Align with the NC Final Exams*) is available on the NCDPI/Accountability Services website.

☐ The NC Final Exams are administered through NCTest, the NCDPI's online assessment platform. Paper editions are available.

☐ The NC Final Exams are only provided in English. Native language translation versions are not available.

Appendix A
Discrete Mathematics NC Final Exam 2016–17
Number of Operational Items by Objective

The following table shows the number of operational items for each objective. Note that future coverage of objectives could vary within the constraints of the test specification weights in *Table 1*. Some objectives not designated with tested items (i.e., "–") may be a prerequisite objective, may be tested within the context of another objective or may be included as an embedded field test item.

Discrete Mathematics Objective	Number of Operational Items by Objective
Competency Goal 1: The learner will use matrices and graphs to model relationships and solve problems.	
1.01.a—Use matrices to model and solve problems. a) Display and interpret data.	2
1.01.b—Use matrices to model and solve problems. b) Write and evaluate matrix expressions to solve problems.	4
1.02—Use graph theory to model relationships and solve problems.	4
Competency Goal 2: The learner will analyze data and apply probability concepts to solve problems.	
2.01.a—Describe data to solve problems. a) Apply and compare methods of data collection.	1
2.01.b—Describe data to solve problems. b) Apply statistical principles and methods in sample surveys.	–
2.01.c—Describe data to solve problems. c) Determine measures of central tendency and spread.	1
2.01.d—Describe data to solve problems. d) Recognize, define, and use the normal distribution curve.	2
2.01.e—Describe data to solve problems. e) Interpret graphical displays of data.	1
2.01.f—Describe data to solve problems. f) Compare distributions of data.	–
2.02.a—Use theoretical and experimental probability to model and solve problems. a) Use addition and multiplication principles.	3
2.02.b—Use theoretical and experimental probability to model and solve problems. b) Calculate and apply permutations and combinations.	1

2.02.c—Use theoretical and experimental probability to model and solve problems. c) Create and use simulations for probability models.	1
2.02.d—Use theoretical and experimental probability to model and solve problems. d) Find expected values and determine fairness.	2
2.02.e—Use theoretical and experimental probability to model and solve problems. e) Identify and use discrete random variables to solve problems	1
2.02.f—Use theoretical and experimental probability to model and solve problems. f) Apply the Binomial Theorem.	–
2.03.a—Model and solve problems involving fair outcomes. a) Apportionment.	2
2.03.b—Model and solve problems involving fair outcomes. b) Election Theory.	3
2.03.c—Model and solve problems involving fair outcomes. c) Voting Power.	2
2.03.d—Model and solve problems involving fair outcomes. d) Fair Division.	–
Competency Goal 3: The learner will describe and use recursively-defined relationships to solve problems.	
3.01.a—Use recursion to model and solve problems. a) Find the sum of a finite sequence.	–
3.01.b—Use recursion to model and solve problems. b) Find the sum of an infinite sequence.	1
3.01.c—Use recursion to model and solve problems. c) Determine whether a given series converges or diverges.	1
3.01.d—Use recursion to model and solve problems. d) Write explicit definitions using iterative processes, including finite differences and arithmetic and geometric formulas.	1
3.01.e—Use recursion to model and solve problems. e) Verify an explicit definition with inductive proof.	–

Document History

Date	Comment	Revision Location	Revision Description
October 5, 2016	Original document posted	N/A	N/A
November 3, 2016	Revision	Appendix A (p. 4) 2.01.d	Edit made to the text in the first column. The number of operational items by objective did not change.
		Appendix A (p. 5) 3.01.b	Edit made to the text in the first column. The number of operational items by objective did not change.