2017–2018 NC Final Exam of Discrete Mathematics

North Carolina Assessment Specifications

Purposes of the Assessments

 The NC Final Exams (NCFEs) for Discrete Mathematics measures students' academic progress on the North Carolina Standard Course of Study, adopted by the North Carolina State Board of Education (SBE) in June 2003.

 The NCFEs are considered standardized artifacts reflective of student growth for teachers and school growth for participants in the teacher evaluation process.

 SBE policy TEST-016 requires public schools to use the course-specific operational assessments as the only final exams for specific courses and to use the results from all course-specific operational assessments as a minimum of twenty percent (20%) of the student's final grade for each respective course.

Developing Assessments

 North Carolina educators are recruited and trained to write new items for the NCFEs. The diversity among the item writers and their knowledge of the content standards are 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. Teachers interested in training to become an item writer or reviewer for the North Carolina Testing Program can visit https://center.ncsu.edu/ncpd/course/view.php?id=128.

 For an in-depth explanation of the test development process see SBE policy TEST-013.

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 NCFE.

 2015–16: Third operational administration of the NCFE.

 2016–17: Fourth operational administration of the NCFE.

 2017–18: Fifth operational administration of the NCFE.

Prioritization of Standards

 Members of the North Carolina Department of Public Instruction's (NCDPI) Test Development Section 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 percentage range of score points that will appear on the Discrete Mathematics NCFE. The table of test specification weights describe the percent of total score points.

Table 1. Test Specification Weights for the ***Discrete Mathematics*** *NCFE* 2003 *Standard Course of Study*

Standard	Percent of Total Score Points
1.01	≈ 18%
1.02	≈ 12%
2.01	≈ 15%
2.02	≈ 24%
2.03	≈ 21%
3.01	≈ 9%
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 of Discrete Mathematics NCFE consists of four-response-option multiple-choice items.

 Students must be provided a graphing calculator, a state-provided formula sheet, graph paper, and blank paper.

 A complete list of the supplemental test materials (i.e., *NC Final Exams Materials List*) may be reviewed at http://www.ncpublicschools.org/accountability/common-exams/.

 Released items, the necessary formula sheet, and graph paper are available at http://www.ncpublicschools.org/accountability/common-exams/released-items/. Released items may be used by school systems to help acquaint students with items. These materials must not be used for personal or financial gain.

 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.

Testing Structure and Test Administration Time

 The Discrete Mathematics NCFE contains 37 multiple-choice items. Included in the total item counts are embedded multiple-choice field test items that will not count toward or against a student's score but these items are indistinguishable from operational items and should not interfere with the student's test-taking experience.

NC Final Exam 2017-18	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 or against the student's 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 NCFE are administered to students enrolled in fall and spring courses. A list of course codes that align with the 2017–2018 NCFE (i.e., *Course Codes that Align with the NC Final Exams*) is available at http://www.ncpublicschools.org/accountability/common-exams/.

 The NCFE are administered through NCTest, the NCDPI's online assessment platform. Paper editions are available.

 The NCFE are only provided in English. Native language translation versions are not available.

Appendix A
Discrete Mathematics NC Final Exam 2017–18
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 Items Operational Per 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. a) Apply and compare methods of data collection.	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 a finite 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.	–