



## Public Schools of North Carolina

State Board of Education • Phillip J. Kirk, Jr., Chairman • North Carolina Department of Public Instruction • Michael E. Ward, Superintendent

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## Calculators and Assessment: The North Carolina Testing Program

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### State Philosophy and Policy for Calculator Use

All North Carolina tests assess the goals and objectives in the North Carolina *Standard Course of Study*. For multiple-choice tests, items are written to test specific objectives; on open-ended tests, items are written to span across the objectives and/or goals. If a student is asked to solve a problem, the focus of all items written for the objective and/or goal should be problem solving, regardless of the process used to solve the problem. If a student is asked to solve a problem using a specific procedure, the focus of all items written for the objective and/or goal should be the procedure. This difference in focus can be enhanced or hindered by the use of specific tools or technology, i.e., calculators, since more sophisticated technology may interfere with the assessment of specific procedures necessary to solve problems.

This publication contains the calculator requirements for the North Carolina Testing Program for 2000-2001 and beyond. Graphing calculators may only be used where specified. The use of keyboarding calculators and symbol manipulation calculators is prohibited during the administration of any North Carolina test. Symbol manipulation calculators are those capable of doing symbolic algebra (i.e., factoring, expanding, or simplifying given variable output), or symbolic calculus. As curricula and technology change, the policy concerning technology use on North Carolina tests (both multiple-choice and open-ended) will be reevaluated.

### Inappropriate Uses of Calculators

Calculators are not appropriate when assessing objectives that ask the student to do tasks that are intended to assess specific mathematical procedures similar to the following: find the square root of perfect squares, solve problems involving the addition of two single-digit numbers, or solve problems by estimation.

Sample Question: For science lab, each wick for the burner should be at least 5 inches long. Which of the following pieces of string could be used to make 10 wicks?

- (a) 5
- (b) 15
- (c) 45
- (d) 100

### Appropriate Uses of Calculators

Calculators are appropriate when assessing objectives where the focus is on problem solving. Calculators become tools for students to demonstrate their understanding of complex problems beyond paper and pencil.

Sample Question: A two-inch cube ( $2 \times 2 \times 2$ ) of silver weighs 3 pounds and is worth \$246.72. How much is a three-inch cube of silver worth?

Graphing calculators are appropriate when assessing objectives where the focus is on solving problems that are not simple in nature (i.e., quadratic, exponential). Sample Question: When a ball is thrown into the air, its height depends on the time since the ball was thrown. The equation for its height is  $h = -t^2 + 2t + 3$ . Find the greatest height above the ground attained by the ball.

The following table contains the minimum calculator requirements for the 2000-2001 school year and beyond. Beginning in the 2000-2001 school year, all North Carolina-developed mathematics tests will measure the mathematics goals and objectives from the revised North Carolina *Standard Course of Study*. In addition, the calculator inactive part of the grade 3 pretest and the end-of-grade mathematics test will contain words. The end-of-course test of Algebra I will be entirely calculator active.

## North Carolina Testing Program: Calculators<sup>1</sup>

Test	Calculator Requirements for 1999-2000 <sup>2</sup>	<u>Minimum</u> Calculator Requirements for 2000-2001 and Beyond <sup>3</sup>
Grade 3 Pretest Mathematics <sup>4</sup>	<u>Mathematics Computation:</u> Calculator use is <u>not</u> allowed.	<u>Calculator Inactive:</u> Calculator use is <u>not</u> allowed.
	<u>Mathematics Applications:</u> <ul style="list-style-type: none"> <li>• Simple 4-function calculator with memory key</li> <li>• Simple 4-function calculator with memory key and correct order of operations feature</li> </ul>	<u>Calculator Active:</u> Four-function calculator with memory key <sup>3</sup>
Open-Ended Assessment Grades 4 & 8 Mathematics	<u>Grade 4:</u> <ul style="list-style-type: none"> <li>• Simple 4-function calculator with memory key</li> <li>• Simple 4-function calculator with memory key and correct order of operations feature</li> </ul>	<u>Grade 4:</u> Four-function calculator with memory key <sup>3</sup>
	<u>Grade 8:</u> <ul style="list-style-type: none"> <li>• Any 4-function calculator with a square root function or algebraic logic</li> <li>• Scientific calculator</li> </ul>	<u>Grade 8:</u> Any four-function calculator with square root function, $y^x$ , $\pi$ ( $pi$ ), and algebraic logic <sup>3</sup>
End-of-Grade Mathematics Test <sup>4</sup> Grades 3–8	<u>Mathematics Computation at Grades 3-8:</u> Calculator use is <u>not</u> allowed.	<u>Calculator Inactive at Grades 3-8:</u> Calculator use is <u>not</u> allowed.
	<u>Mathematics Applications at Grades 3-5:</u> <ul style="list-style-type: none"> <li>• Simple 4-function calculator with memory key</li> <li>• Simple 4-function calculator with memory key and correct order of operations feature</li> </ul>	<u>Calculator Active at Grades 3-5:</u> Four-function calculator with memory key <sup>3</sup>
	<u>Mathematics Applications at Grades 6-8:</u> <ul style="list-style-type: none"> <li>• Any 4-function calculator with a square root function or algebraic logic</li> <li>• Scientific calculator</li> </ul>	<u>Calculator Active at Grades 6-8:</u> Any four-function calculator with square root function, $y^x$ , $\pi$ ( $pi$ ), and algebraic logic <sup>3</sup>
Competency Test (new) Mathematics	<u>Mathematics Computation:</u> Calculator use is <u>not</u> allowed.	<u>Mathematics Computation:</u> Calculator use is <u>not</u> allowed.
	<u>Mathematics Applications:</u> <ul style="list-style-type: none"> <li>• Any 4-function calculator with a square root function or algebraic logic</li> <li>• Scientific calculator</li> </ul>	<u>Mathematics Applications:</u> Any four-function calculator with square root function, $y^x$ , $\pi$ ( $pi$ ), and algebraic logic <sup>3</sup>
High School Comprehensive Mathematics <sup>5</sup>	The expectation is that each student will use a graphing calculator. <i>Students who use scientific calculators will be at a disadvantage.</i>	Graphing Calculator
End-of-Course Tests <sup>5</sup>	<u>Algebra I and Algebra II:</u> Graphing calculator	<u>Algebra I and Algebra II:</u> Graphing calculator
	<u>Chemistry, Geometry, Physical Science, Physics:</u> At least the functions of a scientific calculator but may use a graphing calculator	<u>Chemistry, Physical Science, Physics, and Geometry:</u> Scientific Calculator <sup>3</sup>

<sup>1</sup> The use of keyboarding or symbol manipulation calculators is prohibited during the administration of secure North Carolina tests. Symbol manipulation calculators are those capable of doing symbolic algebra (e.g., factoring, expanding, or simplifying giving variable output) or symbolic calculus. Calculator memory must be cleared prior to and after the test administration.

<sup>2</sup> Graphing calculators may only be used where specified.

<sup>3</sup> For 2000-2001 and beyond, students must use the minimum calculator requirements listed in this column or calculators that have more functions (e.g., graphing calculators). Students are not allowed to use keyboarding or symbol manipulation calculators under any circumstances.

<sup>4</sup> Beginning 1999-2000 mathematics computation will include words and numbers instead of only numbers. Mathematics computation will be renamed calculator inactive; mathematics applications will be renamed calculator active.