The Research-Driven Solution to Raise the Quality of High School Core Courses

QualityCore®

Algebra II

End-of-Course Test Blueprint

ACT®

Test Blueprint
QualityCore® End-of-Course Assessment
Algebra II

The QualityCore® End-of-Course (EOC) system is modular, consisting of either two 35–38 item multiple-choice components or one 35–38 item multiple-choice component combined with a constructed-response component. This approach to measuring achievement of ACT Course Standards allows users to select the configuration that best meets their particular needs, while still receiving scores on a standardized QualityCore scale.

The EOC Test Blueprint tables below show how the test items are distributed across reporting categories and depth-of-knowledge levels. The tables display ranges of the percentages of operational multiple-choice items and the number of operational constructed-response items per test. Sample standards by reporting category are provided, along with definitions of the depth-of-knowledge thinking processes covered by the assessment. The constructed-response scoring guide is also presented.

Reporting category	Percent of multiple-choice items	Number of constructed-response items**
Linear Functions (D*)	15–25	0–1
Number Sense, Quadratic Functions, and Matrices (C, E, I)	15–25	1
Polynomial Functions (F)	15–25	1
Nonpolynomial Functions (G)	15–25	0–1
Probability, Sequences, and Series (H)	15–25	0–1
Total	100	3

* Code indicates ACT Course Standards with which the reporting category is aligned.
** Constructed-response component consists of 3 items: one from Number Sense, Quadratic Functions, and Matrices; one from Polynomial Functions; and one drawn from the 3 remaining reporting categories.

Depth of Knowledge	Percent of multiple-choice items	Number of constructed-response items
Level 1 — Recall	20–40	—
Level 2 — Skill/Concept	25–55	—
Level 3 — Strategic Thinking	15–35	3
Total	100	3

Sample ACT Course Standards by Reporting Category

Linear Functions
- Graph and solve compound inequalities

- Graph systems of linear inequalities
- Solve systems of equations with 3 variables

Number Sense, Quadratic Functions, and Matrices
- Graph and solve quadratic equations and inequalities
- Determine number and type of roots for a quadratic equation
- Determine domain and range of a quadratic function
- Graph and solve systems of quadratic inequalities
- Identify, graph, determine the characteristics of, and write equations of circles and parabolas
- Manipulate complex numbers
- Use matrices to organize data and solve problems

Polynomial Functions
- Evaluate, simplify, and factor polynomial expressions
- Find minimum and maximum values, domain, and range of polynomial functions, both graphically and algebraically
- Recognize connections among zeros, *x*-intercepts, factors, and solutions of polynomial equations

Nonpolynomial Functions
- Manipulate and evaluate radical expressions; solve rational and radical equations
- Convert between logarithmic and exponential equations; graph each
- Use law of cosines and law of sines
- Graph and determine domain, range, amplitude and period of cosine and sine functions

Probability, Sequences, and Series
- Use counting techniques to solve problems
- Use sequences and series to solve problems

Thinking Processes

ACT uses the depth-of-knowledge (DOK) levels (Webb, 2002) to describe the thinking processes assessed by the EOC tests. Webb developed descriptions of the DOK levels specifically for mathematics. He noted that some action verbs, such as "explain," "describe," and "interpret," can be classified at different levels, depending on the object of the action.[1]

Level 1: Recall requires the recall of information such as a fact, term, definition, or simple procedure. Students must demonstrate a rote response or perform a simple procedure. Level 1 items require students to:
- Recall/recognize information, such as facts, definitions, theorems, terms, formulas, or procedures
- Demonstrate an understanding of fundamental math concepts
- Solve a one-step problem
- Perform a well-defined algorithm

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[1] Webb, Norman L. (2002). Depth-of-Knowledge Levels for Four Content Areas. Retrieved from http://facstaff.wcer.wisc.edu/normw/All%20content%20areas%20%20DOK%20levels%2032802.doc

- Apply a formula
- Measure time, objects, distance, etc.

Level 2: Skill/Concept requires mental processing that goes beyond recalling or reproducing an answer. Students must make some decisions about how to approach a problem. The cognitive demands are more complex than in Level 1. Level 2 items require students to:
- Engage in mental processing beyond a habitual response
- Determine how to approach a problem
- Solve routine multistep problems
- Estimate quantities, amounts, etc.
- Use and manipulate multiple formulas, definitions, theorems, or a combination of these
- Collect, organize, classify, display, and compare data
- Interpret information from a simple graph
- Explain direct relationships

Level 3: Strategic Thinking requires planning, thinking, explaining, justifying, using evidence, conjecturing, and postulating. The cognitive demands are complex and abstract, going beyond Level 2. Level 3 items require students to:
- Engage in abstract, complex thinking
- Determine which concepts to use in solving complex problems
- Reason, plan, and use evidence to explain and justify thinking
- Make conjectures
- Interpret information from complex graphs
- Draw conclusions and develop logical arguments
- Use multiple concepts to solve a problem
- Explain phenomena in terms of concepts

QualityCore Mathematics Constructed-Response Holistic Rubric

Score of 4: A response at this level provides evidence of <u>thorough</u> knowledge and understanding of the subject matter.
- The response addresses all parts of the question or problem correctly.
- The response demonstrates efficient and accurate use of appropriate procedures.
- The response shows evidence of a good understanding of mathematical concepts and principles in its strategies and explanations, and it does not contain any misconceptions.
- The response is clear and coherent.

Score of 3: A response at this level provides evidence of <u>competent</u> knowledge and understanding of the subject matter.
- The response addresses most parts of the question or problem correctly.
- The response includes some minor errors but generally uses appropriate procedures accurately.
- The response shows some evidence of a good understanding of mathematical concepts and principles in its strategies and explanations, and it contains few, if any, misconceptions.
- The response is mostly clear and coherent.

Score of 2: A response at this level provides evidence of <u>basic</u> knowledge and understanding of the subject matter.
- The response addresses some parts of the question or problem correctly.
- The response includes a number of errors but demonstrates some use of appropriate procedures.
- The response shows a little evidence of understanding of mathematical concepts and principles in its strategies and explanations, but it may contain some evidence of misconceptions.
- The response is partially clear, but some parts may be difficult to understand.

Score of 1: A response at this level provides evidence of <u>minimal</u> knowledge and understanding of the subject matter.
- The response addresses a few parts of the problem correctly, but the response is mostly incorrect.
- The response includes inappropriate procedures or simple manipulations that show little or no understanding of correct procedures.
- The response shows little or no evidence of understanding of mathematical concepts and principles in its strategies and explanations, and it may contain evidence of significant misconceptions.
- Many parts of the response are difficult to understand.

Score of 0: A response at this level is not scorable.
- The response is off-topic, blank, hostile, or otherwise not scorable.

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