



Aligning mathematics assessment standards: Oklahoma and the 2009 National Assessment of Educational Progress (NAEP)

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After receiving the 2007 REL Southwest alignment study of the Oklahoma Core Curriculum Tests (OCCT) and the National Assessment of Educational Progress (NAEP) assessment standards in science (<http://ies.ed.gov/ncee/edlabs/projects/project.asp?projectID=76&productID=43>), the Oklahoma State Department of Education and the REL Southwest Governing Board requested a similar mathematics alignment study to understand how the OCCT assessment standards align with the 2009 NAEP assessment standards in mathematics.

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Summary

This technical brief examines the current alignment between Oklahoma Core Curriculum Tests (OCCT) and the 2009 National Assessment of Educational Progress (NAEP) mathematics framework. It looks at the extent to which current state assessment standards cover the content on which 2009 NAEP assessments will be based. Applying the methodology used by Regional Educational Laboratory Southwest in 2007 in a similar study that examined the alignment of Oklahoma science assessment standards with the 2009 NAEP, this study presents results for areas of full alignment, partial alignment, nonalignment, and areas where the OCCT assessment standards go beyond the NAEP standards. The study finds that 85 percent of NAEP grade 4, 89 percent of NAEP grade 8, and 74 percent of NAEP grade 12 assessment standards are either fully or partially addressed by the OCCT mathematics assessment standards.

The study analyzes the alignment of the OCCT and 2009 NAEP mathematics assessment standards. It does not analyze individual items or the alignment of state standards with the OCCT assessment items. The study does not make specific recommendations about whether a state should close gaps in alignment to NAEP—a decision for state policymakers. Revising assessments requires substantial time and resources, so policymakers considering such revisions need to weigh the costs of such changes and the benefits they believe such changes will bring to students.

Technical brief

Why this brief?

In 2007 Regional Educational Laboratory Southwest conducted an alignment study of the National Assessment of Educational Progress (NAEP) and the Oklahoma Core Curriculum Tests (OCCT) assessment standards in science (Timms et al. 2007). After receiving the science alignment report, the Oklahoma State Department of Education and the Regional Educational Laboratory Southwest Governing Board requested a similar mathematics alignment study to understand how the OCCT mathematics assessment standards¹ align with the 2009 NAEP mathematics assessment standards.²

One reason for this interest is the No Child Left Behind (NCLB) Act of 2001, which requires states to develop challenging academic content and achievement standards in mathematics and to test public school students in grades 3–8 and 10–12 annually to determine how well they are mastering the subject matter defined in the state standards. States must also participate in the NAEP mathematics assessments in grades 4 and 8 once every two years. Because states set their own unique standards, NAEP is increasingly being used as a benchmark for assessing and comparing student achievement countrywide (see, for example, Linn 2005; Linn, Baker, and Herman 2005).

NAEP data are being used increasingly in education research to investigate how the NCLB provisions have played out in different states. For example, the National Center for Education Statistics (NCES) mapped state test scores on the NAEP scale (NAEP equivalent score) and found differences in what is considered proficient. Proficient in some states mapped to NAEP Basic, while in others it mapped to NAEP Proficient, and in still others it mapped to NAEP Advanced. Much of the discrepancy in the percentages of students scoring proficient on state assessments and on NAEP was

accounted for by how lenient or stringently states defined proficient (U.S. Department of Education, National Center for Education Statistics 2007). But it is unclear how much such discrepancies are also due to other factors, such as a lack of alignment between what is tested on NAEP and on state assessments, differences in the types of items used to test mathematics knowledge and skills (for example, multiple choice questions and short response), and differences in cutpoints for determining proficiency levels.

The findings from this research will better inform Oklahoma policymakers of specific areas in which OCCT and NAEP assessment standards differ so that they can, if necessary, review and revise their standards. This report describes the results of a systematic alignment study conducted for that purpose.

Traditional alignment studies and methods focus on aligning standards and tests. The objective of this study was to compare one set of assessment standards with another (see box 1 for study methodology).

Results

Results are presented for grades 4, 8, and 12 for the research question: To what extent do current state assessment standards on the OCCT cover the content on which 2009 NAEP assessments will be based? Results are presented for areas of full alignment, partial alignment, non-alignment, and areas where the OCCT assessment standards go beyond the NAEP assessment standards. A NAEP assessment standard is considered to be fully addressed by an OCCT assessment standard or standards if all of the content of the NAEP assessment standard is contained in one or more OCCT assessment standards at the same or lower grade level. A NAEP assessment standard is considered to be partially addressed by the OCCT assessment standard or standards if the OCCT assessment

BOX 1

Study methodology

This study used the WestEd methodology, which was designed to incorporate eight of the most prominent alignment methodologies (for a detailed discussion of the WestEd methodology see Timms et al. 2007).

The review team consisted of one senior reviewer and six content reviewers. The senior reviewer had 19 years of experience in mathematics education and had worked in public schools, state education agencies, and a university setting. The six content reviewers were elementary, middle, and high school mathematics educators with 4–37 years of teaching experience. Reviewers attended several training sessions prior to conducting the alignments.

Each reviewer conducted independent alignment ratings of the National Assessment of Education Progress (NAEP) assessment standards and the Oklahoma Core Curriculum Tests (OCCT) assessment standards. First, they conducted gap analyses, identifying content in the grade-specific NAEP assessment standards that was absent in the grade-specific OCCT assessment standards and content in the grade-specific OCCT assessment standards that was absent in the grade-specific NAEP assessment standards. Second, reviewers examined order to determine whether grade-specific NAEP assessment standards were included at the same grade level as the matching content in the OCCT assessment standards. The content reviewers then met in pairs to reach ratings consensus, a method

designed to result in a single rating per NAEP assessment standard (no disagreement was permitted). The senior reviewer led each consensus meeting.

Content reviewers recorded alignment data in a crosswalk instrument that contained NAEP assessment standards at the appropriate grade level in the first column, a column to fill in corresponding OCCT assessment standards, a column for ratings, a column for codes, and a column for reviewers' notes. A coding scheme was used to indicate alignment issues, including whether the assessment standard was covered at a higher or lower grade than the target grade and reason for lack of alignment. A matrix-like format was created to facilitate alignment.

standard or standards address only part of the NAEP assessment standard; the NAEP assessment standard contains more content or more detailed content than the OCCT assessment standard or standards, or the OCCT assessment standard or standards imply but do not explicitly state the content found in the NAEP assessment standard; there is a matching OCCT assessment standard at a higher grade level than the NAEP assessment standard; or there is a matching OCCT assessment standard at a lower grade level than the NAEP assessment standard, but it does not address all the content addressed by the NAEP assessment standard.

Content alignment at grade 4

The content reviewers compared the NAEP grade 4 assessment standards in the *Mathematics Framework for 2009 National Assessment of Educational Progress* (National Assessment Governing Board

2007) with the assessment standards in the *Oklahoma School Testing Program—Mathematics Grade 4* (Oklahoma State Department of Education 2007b). The NAEP provides 65 assessment standards for grade 4. The number of assessment standards per content area in each alignment rating category is shown in table 1.

Eighteen of the NAEP assessment standards (28 percent) are fully addressed by the OCCT assessment standards, 37 (57 percent) are partially addressed, and 10 (15 percent) are not addressed (figure 1). (See appendix A for more details on the alignment of the NAEP grade 4 assessment standards and the OCCT assessment standards and on the OCCT grade 4 assessment standards not covered by NAEP grade 4 assessment standards, including details on assessment standards, ratings, codes, and whether a NAEP assessment standard is addressed at a higher or lower grade.)

TABLE 1

Number of National Assessment of Educational Progress (NAEP) grade 4 mathematics assessment standards and number of Oklahoma Core Curriculum Tests (OCCT) assessment standards by alignment with NAEP, by NAEP content area, March 2008

NAEP content area	Number of NAEP assessment standards	Number of Oklahoma assessment standards by alignment with NAEP ^a		
		Fully addressed	Partially addressed	Not addressed
Number properties and operations	20	4	13	3
Number sense	6	4	2	0
Estimation	3	0	2	1
Number operations	6	0	4	2
Ratios and proportional reasoning	1	0	1	0
Properties of numbers and operations	3	0	3	0
Mathematical reasoning using numbers	1	0	1	0
Measurement	10	2	7	1
Measuring physical attributes	6	2	4	0
Systems of measurement	4	0	3	1
Geometry	15	5	7	3
Dimension and shape	4	1	2	1
Transformation of shapes and preservation of properties	4	2	2	0
Relationships between geometric figures	4	2	2	0
Position, direction, and coordinate geometry	2	0	1	1
Mathematical reasoning in geometry	1	0	0	1
Data analysis, statistics, and probability	9	4	4	1
Data representations	3	2	1	0
Characteristics of data sets	2	0	2	0
Probability	4	2	1	1
Algebra	11	3	6	2
Patterns, relations, and functions	5	1	3	1
Algebraic representations	2	1	1	0
Variables, expressions, and operations	2	0	2	0
Equations and inequalities	1	1	0	0
Mathematical reasoning in algebra	1	0	0	1
All content	65	18	37	10

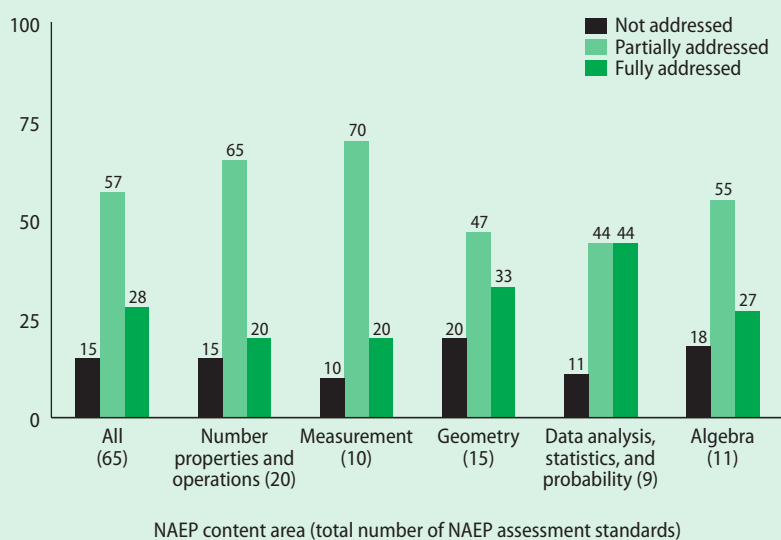
a. NAEP has 65 assessment standards at grade 4, and Oklahoma has 25. Each Oklahoma assessment standard may be mapped to more than one NAEP assessment standard.

Source: Expert content reviewers' summary analysis of data in appendix table A1.

Areas of full alignment. Eighteen (28 percent) of the NAEP grade 4 mathematics assessment standards are fully addressed by the OCCT assessment standards: 4 of 20 number properties

and operations; 2 of 10 measurement; 5 of 15 geometry; 4 of 9 data analysis, statistics, and probability; and 3 of 11 algebra assessment standards. Of these 18 fully addressed NAEP

FIGURE 1
Percentage of National Assessment of Educational Progress (NAEP) grade 4 mathematics assessment standards addressed by the Oklahoma Core Curriculum Tests assessment standards by NAEP content area, March 2008



Source: Expert content reviewers' summary analysis of data in appendix table A1.

assessment standards, 8 are addressed at a lower grade in the Oklahoma assessment standards.

Areas of partial alignment. Thirty-seven (57 percent) of the NAEP grade 4 mathematics assessment standards are partially addressed by the Oklahoma assessment standards: 13 of 20 number properties and operations; 7 of 10 measurement; 7 of 15 geometry; 4 of 9 data analysis, statistics, and probability; and 6 of 11 algebra assessment standards. Of the 37 partially addressed NAEP grade 4 assessment standards, 10 are addressed at a higher grade in the Oklahoma assessment standards. One NAEP standard is partially addressed at a lower grade and a higher grade by the Oklahoma assessment standards.

Areas of nonalignment. Ten (15 percent) of the NAEP mathematics assessment standards are not addressed by the OCCT assessment standards: 3 of 20 number properties and operations; 1 of 10 measurement; 3 of 15 geometry;

1 of 9 data analysis, statistics, and probability; and 2 of 11 algebra assessment standards.

Areas where Oklahoma assessment standards go beyond the NAEP assessment standards. The Oklahoma School Testing Program—Mathematics grade 4 contains 25 assessment standards (Oklahoma State Department of Education 2007b). The NAEP assessment standards do not address one geometry and measurement Oklahoma assessment standard.

Content alignment at grade 8

The content reviewers compared the NAEP grade 8 assessment standards in the *Mathematics Framework for 2009 National Assessment of Educational Progress* (National Assessment Governing Board 2007) with the assessment standards found in the *Oklahoma School Testing Program—Mathematics Grade 8* (Oklahoma State Department of Education 2007f). The NAEP provides 100 assessment standards for grade 8. The numbers of assessment standards per content area in each alignment rating category is shown in table 2.

Thirty-five of these assessment standards (35 percent) are fully addressed by the OCCT assessment standards, 54 (54 percent) are partially addressed, and 11 (11 percent) are not addressed (figure 2). (See appendix B for more details on the NAEP grade 8 assessment standards and the OCCT assessment standards and on the Oklahoma grade 8 assessment standards not covered by NAEP grade 8 assessment standards, including details on assessment standards, ratings, codes, and whether a NAEP assessment standard is addressed at a higher or lower grade.)

Areas of full alignment. Thirty-five (35 percent) of the NAEP grade 8 mathematics assessment standards are fully addressed by the OCCT assessment standards: 10 of 27 number properties and operations; 7 of 12 measurement; 3 of 21 geometry; 9 of 22 data analysis, statistics,

TABLE 2

Number of National Assessment of Educational Progress (NAEP) grade 8 mathematics assessment standards and number of Oklahoma Core Curriculum Tests assessment standards by alignment with NAEP, by NAEP content area, March 2008

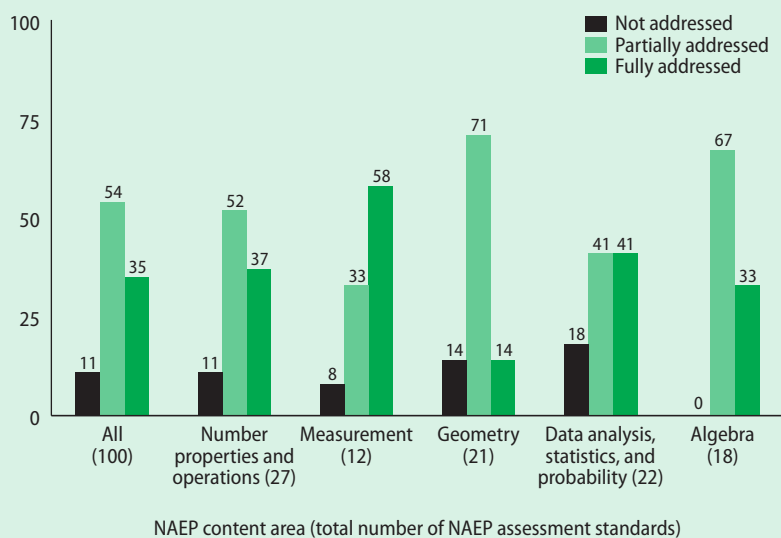
NAEP content area	Number of NAEP assessment standards	Number of Oklahoma assessment standards by alignment with NAEP ^a		
		Fully addressed	Partially addressed	Not addressed
Number properties and operations	27	10	14	3
Number sense	8	4	4	0
Estimation	4	1	3	0
Number operations	4	1	3	0
Ratios and proportional reasoning	4	1	3	0
Properties of numbers and operations	5	3	1	1
Mathematical reasoning using numbers	2	0	0	2
Measurement	12	7	4	1
Measuring physical attributes	6	3	2	1
Systems of measurement	5	4	1	0
Measurement in triangles	1	0	1	0
Geometry	21	3	15	3
Dimension and shape	7	1	6	0
Transformation of shapes and preservation of properties	4	1	3	0
Relationships between geometric figures	5	1	3	1
Position, direction, and coordinate geometry	4	0	3	1
Mathematical reasoning in geometry	1	0	0	1
Data analysis, statistics, and probability	22	9	9	4
Data representations	5	2	3	0
Characteristics of data sets	5	1	3	1
Experiments and samples	3	0	0	3
Probability	9	6	3	0
Algebra	18	6	12	0
Patterns, relations, and functions	5	1	4	0
Algebraic representations	5	0	5	0
Variables, expressions, and operations	2	1	1	0
Equations and inequalities	5	4	1	0
Mathematical reasoning in algebra	1	0	1	0
All content	100	35	54	11

a. NAEP has 100 assessment standards at grade 8, and Oklahoma has 21. Each Oklahoma assessment standard may be mapped to more than one NAEP assessment standard.

Source: Expert content reviewers' summary analysis of data in appendix B1.

FIGURE 2

Percentage of National Assessment of Educational Progress (NAEP) grade 8 mathematics assessment standards addressed by the Oklahoma Core Curriculum Tests assessment standards, by NAEP content area, March 2008



Source: Expert content reviewers' summary analysis of data in appendix B1.

and probability; and 6 of 18 algebra assessment standards. Of these 35 fully addressed NAEP grade 8 assessment standards, 22 are addressed at a lower grade in the OCCT assessment standards.

Areas of partial alignment. Fifty-four (54 percent) of the NAEP grade 8 mathematics assessment standards are partially addressed by the OCCT assessment standards: 14 of 27 number properties and operations; 4 of 12 measurement; 15 of 21 geometry; 9 of 22 data analysis, statistics, and probability; and 12 of 18 algebra assessment standards. Of the 54 partially addressed NAEP grade 8 assessment standards, 9 are addressed at a lower grade and 10 at a higher grade in Oklahoma assessment standards. And two of the NAEP grade 8 assessment standards are partially addressed at a lower and higher grade by Oklahoma assessment standards.

Areas of nonalignment. Eleven (11 percent) of the NAEP grade 8 mathematics assessment

standards are not addressed in the OCCT assessment standards: 3 of 27 number properties and operations; 1 of 12 measurement; 3 of 21 geometry; and 4 of 22 data analysis, statistics, and probability assessment standards.

Areas where Oklahoma assessment standards go beyond the NAEP assessment standards. The *Oklahoma School Testing Program—Mathematics Grade 8* contains 21 assessment standards (Oklahoma State Department of Education 2007f). The NAEP assessment standards do not address 3 of these OCCT assessment standards: 2 of number sense and 1 of measurement.

Content alignment at grade 12

The content reviewers compared the NAEP grade 12 assessment standards in the *Mathematics Framework for 2009 National Assessment of Educational Progress* (National Assessment Governing Board 2007) with the assessment standards in the *Oklahoma School Testing Program—End-of-Instruction Algebra I*, *Oklahoma School Testing Program—End-of-Instruction Algebra II*, and *Oklahoma School Testing Program—End-of-Instruction Geometry* (Oklahoma State Department of Education 2007g,h,i). The NAEP provides 130 assessment standards for grade 12. The number of assessment standards per content area in each alignment rating category is shown in table 3.

Forty-three of these assessment standards (33 percent) are fully addressed by the OCCT assessment standards, 53 (41 percent) are partially addressed, and 34 (26 percent) are not addressed (figure 3). (See appendix C for more details on the alignment of the NAEP grade 12 assessment standards and the OCCT assessment standards and on the OCCT assessment standards not covered by the NAEP grade 12 assessment standards, including details on assessment standards, ratings, codes, and whether a NAEP assessment standard is addressed at a lower grade.)

TABLE 3

Number of National Assessment of Educational Progress (NAEP) grade 12 mathematics assessment standards and number of Oklahoma Core Curriculum Tests assessment standards by alignment with NAEP, by NAEP content area, March 2008

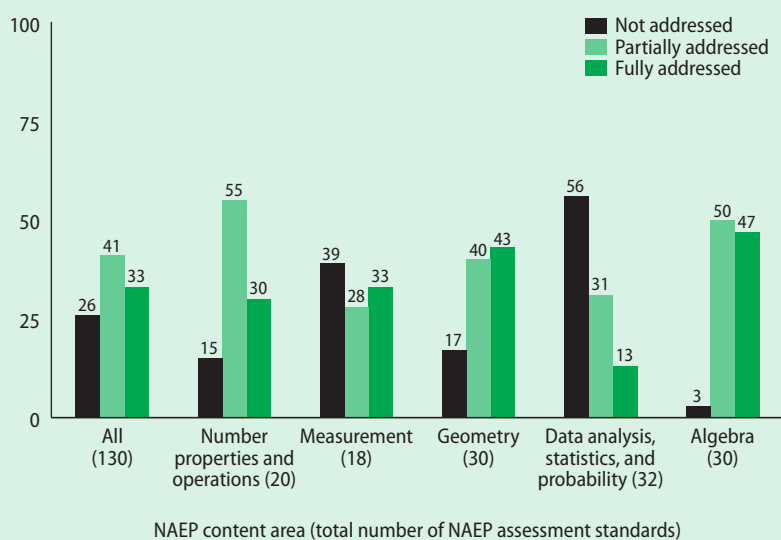
NAEP content area	Number of NAEP assessment standards	Number of Oklahoma assessment standards by alignment with NAEP ^a		
		Fully addressed	Partially addressed	Not addressed
Number properties and operations	20	6	11	3
Number sense	4	0	4	0
Estimation	3	2	1	0
Number operations	5	3	2	0
Ratios and proportional reasoning	2	1	1	0
Properties of numbers and operations	4	0	1	3
Mathematical reasoning using numbers	2	0	2	0
Measurement	18	6	5	7
Measuring physical attributes	6	3	2	1
Systems of measurement	5	1	2	2
Measurement in triangles	7	2	1	4
Geometry	30	13	12	5
Dimension and shape	4	1	3	0
Transformation of shapes and preservation of properties	6	2	3	1
Relationships between geometric figures	7	4	2	1
Position, direction, and coordinate geometry	8	4	1	3
Mathematical reasoning in geometry	5	2	3	0
Data analysis, statistics, and probability	32	4	10	18
Data representation	6	3	2	1
Characteristics of data sets	7	1	2	4
Experiments and samples	5	0	0	5
Probability	9	0	5	4
Mathematical reasoning with data	5	0	1	4
Algebra	30	14	15	1
Patterns, relations, and functions	7	2	5	0
Algebraic representations	7	2	5	0
Variables, expressions, and operations	7	7	0	0
Equations and inequalities	6	3	3	0
Mathematical reasoning in algebra	3	0	2	1
All content	130	43	53	34

a. NAEP has 130 assessment standards at grade 12, and Oklahoma has 93. Each Oklahoma assessment standard may be mapped to more than one NAEP assessment standard.

Source: Expert content reviewers' summary analysis of data in appendix table C1.

FIGURE 3

Percentage of National Assessment of Educational Progress (NAEP) grade 12 mathematics assessment standards that are addressed by Oklahoma Core Curriculum Tests assessment standards, by NAEP content area, March 2008



Source: Expert content reviewers' summary analysis of data in appendix table C1.

Areas of full alignment. Forty-three (33 percent) of the NAEP grade 12 assessment standards are fully addressed by Oklahoma assessment standards: 6 of 20 number properties and operations; 6 of 18 measurement; 13 of 30 geometry; 4 of 32 data analysis, statistics, and probability; and 14 of 30 algebra assessment standards. Of the 43 fully addressed NAEP grade 12 assessment standards, 7 are addressed at a lower grade in the Oklahoma assessment standards.

Areas of partial alignment. Fifty-three (41 percent) of the NAEP grade 12 mathematics assessment standards are partially addressed by the OCCT assessment standards: 11 of 20 number properties and operations; 5 of 18 measurement; 12 of 30 geometry; 10 of 32 data analysis, statistics, and probability; and 15 of 30 algebra assessment standards. Of the 53 partially addressed NAEP grade 12 assessment standards, 2 are addressed at a lower grade in OCCT assessment standards.

Areas of nonalignment. Thirty-four (26 percent) of the NAEP grade 12 mathematics assessment standards are not addressed by the OCCT assessment standards: 3 of 20 number properties and operations; 7 of 18 measurement; 5 of 30 geometry; 18 of 32 data analysis, statistics, and probability; and 1 of 30 algebra assessment standards.

Areas where Oklahoma assessment standards go beyond the NAEP assessment standards. The *Oklahoma School Testing Program—End-of-Instruction Algebra I* contains 27 assessment standards (Oklahoma State Department of Education 2007g). The *Oklahoma School Testing Program—End-of-Instruction Algebra II* contains 37 assessment standards (Oklahoma State Department of Education 2007h). The *Oklahoma School Testing Program—End-of-Instruction Geometry* contains 29 assessment standards (Oklahoma State Department of Education 2007i). Oklahoma assessment standards for algebra I, algebra II, and geometry were used in combination in the grade 12 alignment. The NAEP assessment standards do not address 11 of these assessment standards: 3 of algebra I, 7 of algebra II, and 1 of geometry.

Limitations

The study analyzed the alignment of the OCCT mathematics assessment standards and 2009 NAEP mathematics assessment standards. It did not analyze individual items or the alignment of state assessment standards with OCCT assessment items. The study was not designed to make specific recommendations about whether a state should close gaps in alignment to NAEP—a decision for state policymakers. Revising assessments requires substantial time and resources, so policymakers considering such revisions must weigh the costs of such changes and the benefits they believe the changes will bring to students.

Notes

1. In discussing OCCT, the term *assessment standard* refers to the Priority Academic Student Skills (PASS) content standards and objectives outlined in the *Oklahoma School Testing Program—Oklahoma Core Curriculum Tests (OCCT) Item and Test Specifications for Mathematics* (Oklahoma State Department of Education 2007a–j).
2. In discussing NAEP, the term *assessment standard* refers to the content objectives outlined in the *Mathematics Framework for 2009 National Assessment of Educational Progress, Pre-publication Edition* (National Assessment Governing Board 2007).

Appendix A

Details on the alignment of the National Assessment of Educational Progress grade 4 assessment standards and the Oklahoma Core Curriculum Tests

TABLE A1

Alignment of National Assessment of Educational Progress (NAEP) grade 4 mathematics and Oklahoma Core Curriculum Tests assessment standards, March 2008

NAEP assessment standards	Oklahoma assessment standards	Overall rating ^a	Code ^b	Notes
Number properties and operations				
4N.1 Number sense				
4N.1(a) Identify the place value and actual value of digits in whole numbers.	4-NS-2.1a Apply the concept of place value through 6 digits (e.g., write numbers in expanded form, play a trading game involving place value) 4-NS-2.1b Read, write and rename whole numbers through 6 digits and decimal numbers to the hundredths (e.g., money, numerals to words)	3		
4N.1(b) Represent numbers using models such as base 10 representations, number lines, and two-dimensional models.	3-NS-2.1a Model the concept of place value through 4 digits (e.g., base-10 blocks, bundles of 10s, place value mats) 3-NS-2.1b Read, model and write whole numbers up to 4 digits (e.g., base-10 blocks, expanded form)	3	LG	
4N.1(c) Compose or decompose whole quantities by place value (e.g., write whole numbers in expanded notation using place value: $342 = 300 + 40 + 2$).	4-NS-2.1a Apply the concept of place value through 6 digits (e.g., write numbers in expanded form, play a trading game involving place value)	3		
4N.1(d) Write or rename whole numbers (e.g., $10: 5 + 5$, $12 - 2$, 2×5).	4-NS-2.1b Read, write and rename whole numbers through 6 digits and decimal numbers to the hundredths (e.g., money, numerals to words)	3		
4N.1(e) Connect model, number word, or number using various models and representations for whole numbers, fractions, and decimals.	4-NS-3b Create physical and pictorial models of equivalent and nonequivalent fractional parts to be compared, added or subtracted (e.g., egg cartons, fraction strips, circles, and squares)	2	MC	The grade 4 Oklahoma assessment standard does not specify whole numbers or decimals
4N.1(i) Order or compare whole numbers, decimals, or fractions.	4-NS-2.2 Compare and order whole numbers and decimals to the hundredths place (e.g., pictures of shaded regions of two-dimensional figures, use $>$, $<$, $=$ symbols)	2	MC	The grade 4 Oklahoma assessment standard does not include fractions

(CONTINUED)

TABLE A1 (CONTINUED)

Alignment of National Assessment of Educational Progress (NAEP) grade 4 mathematics and Oklahoma Core Curriculum Tests assessment standards, March 2008

NAEP assessment standards	Oklahoma assessment standards	Overall rating ^a	Code ^b	Notes
Number properties and operations				
4N.2 Estimation				
4N.2(a) Use benchmarks (well-known numbers used as meaningful points for comparison) for whole numbers, decimals, or fractions in contexts (e.g., $\frac{1}{2}$ and .5 may be used as benchmarks for fractions and decimals between 0 and 1.00).	4-NS-3a Use 0, $\frac{1}{2}$, and 1 or 0, 0.5, and 1, as benchmarks and place additional fractions and decimals on a number line (e.g., $\frac{1}{3}$, $\frac{3}{4}$, 0.7, 0.4)	2	IC	
4N.2(b) Make estimates appropriate to a given situation with whole numbers, fractions, or decimals by: <ul style="list-style-type: none"> • knowing when to estimate, • selecting the appropriate type of estimate, including overestimate, underestimate, and range of estimate, or • selecting the appropriate method of estimation (e.g., rounding). 	4-NO-3.3 Apply a variety of estimation and mental math techniques to simplify computations (e.g., use rounding to estimate $82 - 58$ is about $80 - 60$ or 20, use $30 \cdot 5$ to find the product of $300 \cdot 5$)	2	MD	
4N.2(c) Verify solutions or determine the reasonableness of results in meaningful contexts.		1		
4N.3 Number operations				
4N.3(a) Add and subtract: <ul style="list-style-type: none"> • whole numbers, or • fractions with like denominators, or • decimals through hundredths. 	3-NO-3.1 Estimate, find the sum and difference, with and without regrouping, of 3- and 4-digit numbers to solve application problems 5-NO-3.2a Add and subtract decimal numbers with the same and different place values (e.g., $3.72 + 1.4$) to solve problems. 5-NO-3.2c Add and subtract fractions and mixed numbers to solve problems using a variety of methods (e.g., use fraction strips, find the least common denominator [LCD])	2	HG LG	
4N.3(b) Multiply whole numbers: <ul style="list-style-type: none"> • no larger than two-digit by two-digit with paper and pencil computation, or • larger numbers with use of calculator. 	4-NO-3.1 Estimate and find the product of 2- and 3-digit numbers to solve application problems	2	MD	The grade 4 Oklahoma assessment standard does not specify using calculators

(CONTINUED)

TABLE A1 (CONTINUED)

Alignment of National Assessment of Educational Progress (NAEP) grade 4 mathematics and Oklahoma Core Curriculum Tests assessment standards, March 2008

NAEP assessment standards	Oklahoma assessment standards	Overall rating ^a	Code ^b	Notes
Number properties and operations				
4N.3 Number operations				
4N.3(c) Divide whole numbers: • up to three-digits by one-digit with paper and pencil computation, or • up to five-digits by two-digits with use of calculator.	4-NO-3.2a Demonstrate fluency with basic division facts and fact families (i.e., memorize and apply division facts) 4-NO-3.2c Estimate and find the quotient (with and without remainders) with a 1-digit divisor and a 2- or 3-digit dividend to solve application problems	2	MC	These grade 4 Oklahoma assessment standards do not specify up to five-digits by two-digits with use of calculator
4N.3(d) Describe the effect of operations on size (whole numbers).		1		
4N.3(e) Interpret whole number operations and the relationships between them.		1		
4N.3(f) Solve application problems involving numbers and operations.	4-NO-3.1 Estimate and find the product of 2- and 3-digit numbers to solve application problems. 4-NO-3.2c Estimate and find the quotient (with and without remainders) with a 1-digit divisor and a 2- or 3-digit dividend to solve application problems	2	IC MC	The grade 4 Oklahoma assessment standard refers only to multiplication and division
4N.4 Ratios and proportional reasoning				
4N.4(a) Use simple ratios to describe problem situations.	7-NS-2.2b Set up equivalent ratios, estimate and solve problems using ratio, proportions, and percents including percents greater than 100 and less (e.g., determine missing sides of similar figures, heart rate per minute, cost per pound, pay to hours worked overtime)	2	HG	
4N.5 Properties of numbers and operations				
4N.5(a) Identify odd and even numbers.	4-PR-1.1 Discover, describe, extend, and create a wide variety of patterns using tables, graphs, rules, and models (e.g., use 1-inch tiles to demonstrate that doubling the length of the side of a square more than doubles the area, explore the characteristics of odd and even numbers, extend patterns of geometric shapes)	2	IC	
4N.5(b) Identify factors of whole numbers.	5-NS-2.2b Identify and apply factors, multiples, prime, and composite numbers in a variety of problem-solving situations (e.g., build rectangular arrays for numbers 1–100 and classify as prime or composite)	2	HG	

(CONTINUED)

TABLE A1 (CONTINUED)

Alignment of National Assessment of Educational Progress (NAEP) grade 4 mathematics and Oklahoma Core Curriculum Tests assessment standards, March 2008

NAEP assessment standards	Oklahoma assessment standards	Overall rating ^a	Code ^b	Notes
Number properties and operations				
4N.5 Properties of numbers and operations				
4N.5(e) Apply basic properties of operations.	5-NS-2.2a Apply the basic properties of arithmetic: commutative, associative, distributive, and identity (e.g., show $2(5 + 1) = (2 \cdot 5) + (2 \cdot 1)$, given $(5 + 1) + (5 + 1)$ regroup to show this equals $(5 + 5) + (1 + 1)$ concluding with $(2 \cdot 5) + (2 \cdot 1)$) to solve problems	2	HG	
4N.6 Mathematical reasoning using numbers				
4N.6(a) Explain or justify a mathematical concept or relationship (e.g., explain why 15 is an odd number or why $7 - 3$ is not the same as $3 - 7$).	4-PR-1.1 Discover, describe, extend, and create a wide variety of patterns using tables, graphs, rules, and models (e.g., use 1-inch tiles to demonstrate that doubling the length of the side of a square more than doubles the area, explore the characteristics of odd and even numbers, extend patterns of geometric shapes)	2	IC	
Measurement				
4M.1 Measuring physical attributes				
4M.1(a) Identify the attribute that is appropriate to measure in a given situation.	4-GM-4.4b Select appropriate customary and metric units of measure to solve application problems involving length, weight, mass, and volume	3		
4M.1(b) Compare objects with respect to a given attribute, such as length, area, volume, time, or temperature.	4-GM-4.4a Establish benchmarks for customary and metric units and estimate the measures of a variety of objects and compare units (e.g., mass: the mass of a raisin is about 1 gram, length: the width of a finger is about 1 centimeter) 4-GM-4.4b Select appropriate customary and metric units of measure to solve application problems involving length, weight, mass, and volume	2	MC	These grade 4 Oklahoma assessment standards do not specify area, time, or temperature
4M.1(c) Estimate the size of an object with respect to a given measurement attribute (e.g., length, perimeter, or area using a grid).	4-GM-4.4a Establish benchmarks for customary and metric units and estimate the measures of a variety of objects and compare units (e.g., mass: the mass of a raisin is about 1 gram, length: the width of a finger is about 1 centimeter)	3		
4M.1(e) Select or use appropriate measurement instruments such as ruler, meter stick, clock, thermometer, or other scaled instruments.	4-GM-4.4b Measurement Select appropriate customary and metric units of measure to solve application problems involving length, weight, mass, and volume	2	IC	The grade 4 Oklahoma assessment standard does not specify using measurement instruments

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TABLE A1 (CONTINUED)

Alignment of National Assessment of Educational Progress (NAEP) grade 4 mathematics and Oklahoma Core Curriculum Tests assessment standards, March 2008

NAEP assessment standards	Oklahoma assessment standards	Overall rating ^a	Code ^b	Notes
Measurement				
4M.1 Measuring physical attributes				
4M.1(f) Solve problems involving perimeter of plane figures.	5-GM-4.2 Find the perimeter of simple polygons and area of a rectangle (e.g., use 1-inch tiles to build rectangles of different perimeters and areas)	2	HG	
4M.1(g) Solve problems involving area of squares and rectangles.	5-GM-4.2 Find the perimeter of simple polygons and area of a rectangle (e.g., use 1-inch tiles to build rectangles of different perimeters and areas)	2	HG	
4M.2 Systems of measurement				
4M.2(a) Select or use appropriate type of unit for the attribute being measured such as length, time, or temperature.	4-GM-4.4b Select appropriate customary and metric units of measure to solve application problems involving length, weight, mass, and volume	2	IC	The grade 4 Oklahoma assessment standard does not specify time and temperature
4M.2(b) Solve problems involving conversions within the same measurement system such as conversions involving inches and feet or hours and minutes.	5-GM-4.5 Convert basic measurements of volume, weight and distance within the same system for metric and customary units (e.g., inches to feet, hours to minutes, centimeters to meters)	2	HG	
4M.2(d) Determine appropriate size of unit of measurement in problem situation involving such attributes as length, time, capacity, or weight.	4-GM-4.4a Establish benchmarks for customary and metric units and estimate the measures of a variety of objects and compare units (e.g., mass: the mass of a raisin is about 1 gram, length: the width of a finger is about 1 centimeter)	2	IC	
4M.2(e) Determine situations in which a highly accurate measurement is important.		1		
Geometry				
4G.1 Dimension and shape				
4G.1(a) Explore properties of paths between points.	4-GM-4.1a Identify, draw, and construct models of intersecting, parallel, and perpendicular lines (e.g., use spaghetti, straws, toothpicks)	2	IC	
4G.1(b) Identify or describe (informally) real-world objects using simple plane figures (e.g., triangles, rectangles, squares, and circles) and simple solid figures (e.g., cubes, spheres, and cylinders).		1		

(CONTINUED)

TABLE A1 (CONTINUED)

Alignment of National Assessment of Educational Progress (NAEP) grade 4 mathematics and Oklahoma Core Curriculum Tests assessment standards, March 2008

NAEP assessment standards	Oklahoma assessment standards	Overall rating ^a	Code ^b	Notes
Geometry				
4G.1 Dimension and shape				
4G.1(c) Identify or draw angles and other geometric figures in the plane.	4-GM-4.1b Identify and compare angles equal to, less than, or greater than 90 degrees (e.g., use right angles to determine the approximate size of other angles; make a variety of angles using flexible straws and compare)	2	MC	
4G.1(f) Describe attributes of two- and three-dimensional shapes.	3-GM-4.1a Describe and compare two- and three-dimensional shapes (e.g., count the edges and faces of a cube, combine or divide basic shapes to form new shapes, identify and draw congruent shapes)	3	LG	
4G.2 Transformation of shapes and preservation of properties				
4G.2(a) Identify whether a figure is symmetrical, or draw lines of symmetry.	5-GM-4.1 Identify and describe the basic properties of figures (e.g., two or three-dimensionality, symmetry, number of faces, types of angles)	2	HG	
4G.2(c) Identify the images resulting from flips (reflections), slides (translations), or turns (rotations).	4-GM-4.3a Describe the effects on two- and three-dimensional objects when they slide (translate), flip (reflect), and turn (rotate) (e.g., tessellations)	3		
4G.2(d) Recognize which attributes (such as shape and area) change or don't change when plane figures are cut up or rearranged.	4-GM-4.3b Predict and verify the effects of combining, subdividing, and changing two- and three-dimensional figures (e.g., folding paper, tiling, and rearranging pieces of solids)	2	IC	
4G.2(e) Match or draw congruent figures in a given collection.	3-GM-4.1a Describe and compare two- and three-dimensional shapes (e.g., count the edges and faces of a cube, combine or divide basic shapes to form new shapes, identify and draw congruent shapes)	3	LG	
4G.3 Relationships between geometric figures				
4G.3(a) Analyze or describe patterns of geometric figures by increasing number of sides, changing size or orientation (e.g., polygons with more and more sides).	4-PR-1.1 Discover, describe, extend, and create a wide variety of patterns using tables, graphs, rules, and models (e.g., use 1-inch tiles to demonstrate that doubling the length of the side of a square more than doubles the area, explore the characteristics of odd and even numbers, extend patterns of geometric shapes)	2	IC	

(CONTINUED)

TABLE A1 (CONTINUED)

Alignment of National Assessment of Educational Progress (NAEP) grade 4 mathematics and Oklahoma Core Curriculum Tests assessment standards, March 2008

NAEP assessment standards	Oklahoma assessment standards	Overall rating ^a	Code ^b	Notes
Geometry				
4G.3 Relationships between geometric figures				
4G.3(b) Assemble simple plane shapes to construct a given shape.	4-GM-4.3b Predict and verify the effects of combining, subdividing, and changing two - and three- dimensional figures (e.g., folding paper, tiling, and rearranging pieces of solids)	2	IC	
4G.3(c) Recognize two-dimensional faces of three-dimensional shapes.	3-GM-4.1a Describe and compare two- and three-dimensional shapes (e.g., count the edges and faces of a cube, combine or divide basic shapes to form new shapes, identify and draw congruent shapes)	3	LG	
4G.3(f) Describe and compare properties of simple and compound figures composed of triangles, squares, and rectangles.	3-GM-4.1a Describe and compare two- and three-dimensional shapes (e.g., count the edges and faces of a cube, combine or divide basic shapes to form new shapes, identify and draw congruent shapes)	3	LG	
4G.4 Position, direction, and coordinate geometry				
4G.4(a) Describe relative positions of points and lines using the geometric ideas of parallelism or perpendicularity.	4-GM-4.1a Identify, draw, and construct models of intersecting, parallel, and perpendicular lines (e.g., use spaghetti, straws, toothpicks)	2	IC	
4G.4(d) Construct geometric figures with vertices at points on a coordinate grid.		1		
4G.5 Mathematical reasoning in geometry				
4G.5(a) Distinguish which objects in a collection satisfy a given geometric definition and explain choices.		1		
Data analysis, statistics, and probability				
4P.1 Data representation				
The following representations of data are indicated for each grade level. Objectives in which only a subset of these representations is applicable are indicated in the parentheses associated with the objective: pictographs, bar graphs, circle graphs, line graphs, line plots, tables, and tallies.				
4P.1(a) Read or interpret a single set of data.	4-DP-5.1a Examine data displays such as tallies, tables, charts and graphs and use the observations to pose and answer questions (e.g., choose a table in social studies of population data and write problems)	3		

(CONTINUED)

TABLE A1 (CONTINUED)

Alignment of National Assessment of Educational Progress (NAEP) grade 4 mathematics and Oklahoma Core Curriculum Tests assessment standards, March 2008

NAEP assessment standards	Oklahoma assessment standards	Overall rating ^a	Code ^b	Notes
Data analysis, statistics, and probability				
4P.1 Data representation				
4P.1(b) For a given set of data, complete a graph (limits of time make it difficult to construct graphs completely).	4-DP-5.1b Collect, organize and record data in tables and graphs (e.g., bar, pictograph, line plots)	3		
4P.1(c) Solve problems by estimating and computing within a single set of data.	4-DP-5.1a Examine data displays such as tallies, tables, charts and graphs and use the observations to pose and answer questions (e.g., choose a table in social studies of population data and write problems)	2	IC	The grade 4 Oklahoma assessment standard does not specify computing or estimating within a single set of data
4P.2 Characteristics of data sets				
4P.2(b) Given a set of data or a graph, describe the distribution of the data using median, range, or mode.	5-DP-5.1e Determine the range (spread) and the mean (average) of a set of data 6-DS-5.3 Find the median and mode for a set of data in a variety of contexts.	2	HG	
4P.2(d) Compare two sets of related data.	5-DP-5.1c Compare and translate between displays of data (e.g., multiple sets of data on the same graph, Venn diagrams, a combination of diagrams, charts, tables, graphs)	2	HG	
4P.4 Probability				
4P.4(a) Use informal probabilistic thinking to describe chance events (i.e., likely and unlikely, certain and impossible).	3-DP-5.2a Describe the probability (more, less, or equally likely) of chance events	3	LG	
4P.4(b) Determine a simple probability from a context that includes a picture.		1		
4P.4(e) List all possible outcomes of a given situation or event.	3-DP-5.2b List arrangements (permutations) and combinations of up to three items (e.g., possible ways to arrange scoops of chocolate, strawberry and vanilla ice cream on a cone)	3	LG	
4P.4(g) Represent the probability of a given outcome using a picture or other graphic.	5-DP-5.2a Determine the probability of events occurring in familiar contexts or experiments and express probabilities as fractions (e.g., find the fractional probability of an event given a biased spinner)	2	HG	

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TABLE A1 (CONTINUED)

Alignment of National Assessment of Educational Progress (NAEP) grade 4 mathematics and Oklahoma Core Curriculum Tests assessment standards, March 2008

NAEP assessment standards	Oklahoma assessment standards	Overall rating ^a	Code ^b	Notes
Algebra				
4A.1 Patterns, relations, and functions				
4A.1(a) Recognize, describe, or extend numerical patterns.	4-PR-1.1 Discover, describe, extend, and create a wide variety of patterns using tables, graphs, rules, and models (e.g., use 1-inch tiles to demonstrate that doubling the length of the side of a square more than doubles the area, explore the characteristics of odd and even numbers, extend patterns of geometric shapes)	3		
4A.1(b) Given a pattern or sequence, construct or explain a rule that can generate the terms of the pattern or sequence.	4-PR-1.2a Use a variety of techniques to generalize number patterns (e.g., use function machines and “t-tables” to demonstrate “What is the rule?”)	2	MD	
4A.1(c) Given a description, extend or find a missing term in a pattern or sequence.	4-PR-1.1 Discover, describe, extend, and create a wide variety of patterns using tables, graphs, rules, and models (e.g., use 1-inch tiles to demonstrate that doubling the length of the side of a square more than doubles the area, explore the characteristics of odd and even numbers, extend patterns of geometric shapes)	2	MD	
4A.1(d) Create a different representation of a pattern or sequence given a verbal description.	4-PR-1.1 Discover, describe, extend, and create a wide variety of patterns using tables, graphs, rules, and models (e.g., use 1-inch tiles to demonstrate that doubling the length of the side of a square more than doubles the area, explore the characteristics of odd and even numbers, extend patterns of geometric shapes)	2	MD	
4A.1(e) Recognize or describe a relationship in which quantities change proportionally.		1		
4A.2 Algebraic representations				
4A.2(a) Translate between the different forms of representations (symbolic, numerical, verbal, or pictorial) of whole number relationships (such as from a written description to an equation or from a function table to a written description).	4-PR-1.1 Discover, describe, extend, and create a wide variety of patterns using tables, graphs, rules, and models (e.g., use 1-inch tiles to demonstrate that doubling the length of the side of a square more than doubles the area, explore the characteristics of odd and even numbers, extend patterns of geometric shapes) 4-PR-1.2a Use a variety of techniques to generalize number patterns (e.g., use function machines and “t-tables” to demonstrate “What is the rule?”)	2	MC	These grade 4 Oklahoma assessment standards do not specify translating an equation

(CONTINUED)

TABLE A1 (CONTINUED)

Alignment of National Assessment of Educational Progress (NAEP) grade 4 mathematics and Oklahoma Core Curriculum Tests assessment standards, March 2008

NAEP assessment standards	Oklahoma assessment standards	Overall rating ^a	Code ^b	Notes
Algebra				
4A.2 Algebraic representations				
4A.2(c) Graph or interpret points with whole number or letter coordinates on grids or in the first quadrant of the coordinate plane.	3-GM-4.1b Identify locations on a grid with ordered pairs (e.g., give the location of a ship on a grid by selecting D, 1)	3	LG	
4A.3 Variables, expressions, and operations				
4A.3(a) Use letters and symbols to represent an unknown quantity in a simple mathematical expression.	4-PR-1.2b Solve simple open sentences involving operations on whole numbers (with a variable, e.g., $a + 17 = 23$)	2	IC	
4A.3(b) Express simple mathematical relationships using number sentences.	4-PR-1.2a Use a variety of techniques to generalize number patterns (e.g., use function machines and “t-tables” to demonstrate “What is the rule?”) 4-PR-1.2b Solve simple open sentences involving operations on whole numbers (with a variable, e.g., $a + 17 = 23$)	2	IC	
4A.4 Equations and inequalities				
4A.4(a) Find the value of the unknown in a whole number sentence.	4-PR-1.2b Solve simple open sentences involving operations on whole numbers (with a variable, e.g., $a + 17 = 23$)	3		
4A.5 Mathematical reasoning in algebra				
4A.5(a) Verify a conclusion using algebraic properties.		1		

a. Rating is based on a scale of 1 to 3, where 1 indicates that the OCCT standard or standards do not address the NAEP assessment standard, 2 that the OCCT standard or standards partially address the NAEP assessment standard, and 3 that the OCCT standard or standards fully address or exceed the NAEP assessment standard at the targeted grade level. A NAEP assessment standard is considered to be *fully addressed* by the OCCT standard or standards if all of the content in the NAEP assessment standard is contained in one or more OCCT assessment standards at the same or lower grade level. A NAEP standard is considered to be *partially addressed* by the OCCT assessment standard or standards if the OCCT assessment standard or standards address only one part of the NAEP standard; the NAEP standard contains more content or more detailed content than the OCCT standard or standards or the OCCT assessment standard or standards imply but do not explicitly state the content found in the NAEP assessment standard; there is a matching OCCT assessment standard at a higher state grade level than the NAEP; or there is a matching OCCT standard or standards at a lower grade level than the NAEP assessment standard, but it does not address all the content addressed by the NAEP assessment standard.

b. Codes: IC = implied content, LG = content covered at a lower grade level, HG = content covered at a higher grade level, MC = more content, MD = more detailed content.

Source: Expert content reviewers' analysis based on data from National Assessment Governing Board (2007) and Oklahoma State Department of Education (2007a,b,c,e).

TABLE A2

Oklahoma Core Curriculum Tests (OCCT) grade 4 assessment standard not covered by the National Assessment of Educational Progress (NAEP) grade 4 assessment standards, March 2008

OCCT standard	Assessment standard not covered by NAEP
Geometry and measurement	4-GM-4.4c Solve application problems involving money, time, and temperature (e.g., elapsed time)

Source: Oklahoma State Department of Education (2007b).

Appendix B

Details on the alignment of the National Assessment of Educational Progress grade 8 assessment standards and the Oklahoma Core Curriculum Tests assessment standards

TABLE B1

Alignment of National Assessment of Educational Progress (NAEP) grade 8 mathematics and Oklahoma Core Curriculum Tests assessment standards, March 2008

NAEP assessment standards	Oklahoma assessment standards	Overall rating ^a	Code ^b	Notes
Number properties and operations				
8N.1 Number sense				
8N.1(a) Use place value to model and describe integers and decimals.	8-NS-2.1a Compare and order rational numbers (positive and negative integers, fractions, decimals) in real-life situations	2	IC	This grade 8 Oklahoma assessment standard does not specify place value
8N.1(b) Model or describe rational numbers or numerical relationships using number lines and diagrams.	8-NS-2.1a Compare and order rational numbers (positive and negative integers, fractions, decimals) in real-life situations	2	IC	
8N.1(d) Write or rename rational numbers.	6-NS-2.2 Convert, compare, and order decimals (terminating and nonterminating), fractions and percents using a variety of methods	3	LG	
8N.1(e) Recognize, translate between, or apply multiple representations of rational numbers (fractions, decimals, and percents) in meaningful contexts.	8-NS-2.1a Compare and order rational numbers (positive and negative integers, fractions, decimals) in real-life situations 8-NS-2.1b Use the basic operations on rational numbers to solve problems in real-life situations (e.g., describe the effect of multiplying whole numbers by a fraction or a decimal less than 1)	2	MC	These grade 8 Oklahoma assessment standards do not specify translating between rational numbers
8N.1(f) Express or interpret numbers using scientific notation from real-life contexts.	8-NS-2.2b Represent and interpret large numbers and numbers less than one in exponential and scientific notation	3		
8N.1(g) Find or model absolute value or apply to problem situations.	AI-NA-1.2a Simplify and evaluate linear, absolute value, rational and radical expressions	2	HG	
8N.1(h) Order or compare rational numbers (fractions, decimals, percents, or integers) using various models and representations (e.g., number line).	8-NS-2.1a Compare and order rational numbers (positive and negative integers, fractions, decimals) in real-life situations	3		
8N.1(i) Order or compare rational numbers including very large and small integers, and decimals and fractions close to zero.	8-NS-2.1a Compare and order rational numbers (positive and negative integers, fractions, decimals) in real-life situations 8-NS-2.2b Represent and interpret large numbers and numbers less than one in exponential and scientific notation	3		

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TABLE B1 (CONTINUED)

Alignment of National Assessment of Educational Progress (NAEP) grade 8 mathematics and Oklahoma Core Curriculum Tests assessment standards, March 2008

NAEP assessment standards	Oklahoma assessment standards	Overall rating ^a	Code ^b	Notes
Number properties and operations				
8N.2 Estimation				
8N.2(a) Establish or apply benchmarks for rational numbers and common irrational numbers (e.g., π) in contexts.	8-NS-2.1a Compare and order rational numbers (positive and negative integers, fractions, decimals) in real-life situations	2	MC	This grade 8 Oklahoma assessment standard does not specify irrationals
8N.2(b) Make estimates appropriate to a given situation by: <ul style="list-style-type: none"> identifying when estimation is appropriate, determining the level of accuracy needed, selecting the appropriate method of estimation, or analyzing the effect of an estimation method on the accuracy of results. 	6-NS-2.3 Estimate solutions to single and multi-step problems using whole numbers, decimals, fractions, and percents and assess whether solutions are reasonable (e.g., $7/8 + 8/9$ is about 2, $0.9 + 0.3$ is about 1)	2	LG MC	
8N.2(c) Verify solutions or determine the reasonableness of results in a variety of situations including calculator and computer results.	6-NS-2.3 Estimate solutions to single and multi-step problems using whole numbers, decimals, fractions, and percents and assess whether solutions are reasonable (e.g., $7/8 + 8/9$ is about 2, $0.9 + 0.3$ is about 1)	3	LG	
8N.2(d) Estimate square or cube roots of numbers less than 1,000 between two whole numbers.	7-NS-2.3c Estimate the square root of a number (e.g., between two consecutive integers)	2	LG MC	Oklahoma assessment standard does not include cube roots
8N.3 Number operations				
8N.3(a) Perform computations with rational numbers.	8-NS-2.1b Use the basic operations on rational numbers to solve problems in real-life situations (e.g., describe the effect of multiplying whole numbers by a fraction or a decimal less than 1)	3		
8N.3(d) Describe the effect of multiplying and dividing by numbers including the effect of multiplying or dividing a rational number by: <ul style="list-style-type: none"> zero, or a number less than zero, or a number between zero and one, one, or a number greater than one. 	8-NS-2.1b Use the basic operations on rational numbers to solve problems in real-life situations (e.g., describe the effect of multiplying whole numbers by a fraction or a decimal less than 1)	2	MD	The NAEP assessment standard is very specific
8N.3(e) Interpret rational number operations and the relationships between them.	8-NS-2.1b Use the basic operations on rational numbers to solve problems in real-life situations (e.g., describe the effect of multiplying whole numbers by a fraction or a decimal less than 1)	2	IC	

(CONTINUED)

TABLE B1 (CONTINUED)

Alignment of National Assessment of Educational Progress (NAEP) grade 8 mathematics and Oklahoma Core Curriculum Tests assessment standards, March 2008

NAEP assessment standards	Oklahoma assessment standards	Overall rating ^a	Code ^b	Notes
Number properties and operations				
8N.3 Number operations				
8N.3(f) Solve application problems involving rational numbers and operations using exact answers or estimates as appropriate.	8-NS-2.1b Use the basic operations on rational numbers to solve problems in real-life situations (e.g., describe the effect of multiplying whole numbers by a fraction or a decimal less than 1)	2	MC	This grade 8 Oklahoma assessment standard does not specify estimation
8N.4 Ratios and proportional reasoning				
8N.4(a) Use ratios to describe problem situations.	8-NS-2.1b Set up equivalent ratios, estimate and solve problems using ratio, proportions, and percents including percents greater than 100 and less than 1 (e.g., determine missing sides of similar figures, heart rate per minute, cost per pound, pay to hours worked overtime) 8-NS-2.1c Apply ratios and proportions to solve problems	3		
8N.4(b) Use fractions to represent and express ratios and proportions.	8-NS-2.1b Set up equivalent ratios, estimate and solve problems using ratio, proportions, and percents including percents greater than 100 and less than 1 (e.g., determine missing sides of similar figures, heart rate per minute, cost per pound, pay to hours worked overtime)	2	IC	
8N.4(c) Use proportional reasoning to model and solve problems (including rates and scaling).	8-NS-2.1c Apply ratios and proportions to solve problems	2	MD	This grade 8 Oklahoma assessment standard does not specify rates and scaling
8N.4(d) Solve problems involving percentages (including percent increase and decrease, interest rates, tax, discount, tips, or part/whole relationships).	8-NS-2.1b Set up equivalent ratios, estimate and solve problems using ratio, proportions, and percents including percents greater than 100 and less than 1 (e.g., determine missing sides of similar figures, heart rate per minute, cost per pound, pay to hours worked overtime)	2	MD	This grade 8 Oklahoma assessment standard does not specify percent increase and decrease, interest rates, tax, discount, tips, or part/whole relationships
8N.5 Properties of numbers and operations				
8N.5(a) Describe odd and even integers and how they behave under different operations.	8-NS-2.1b Use the basic operations on rational numbers to solve problems in real-life situations (e.g., describe the effect of multiplying whole numbers by a fraction or a decimal less than 1)	2	IC	The example in the Oklahoma assessment standard is similar to the NAEP assessment standard but does not seem to fit

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TABLE B1 (CONTINUED)

Alignment of National Assessment of Educational Progress (NAEP) grade 8 mathematics and Oklahoma Core Curriculum Tests assessment standards, March 2008

NAEP assessment standards	Oklahoma assessment standards	Overall rating ^a	Code ^b	Notes
Number properties and operations				
8N.5 Properties of numbers and operations				
8N.5(b) Recognize, find, or use factors, multiples, or prime factorization.	5-NS-2.2b Identify and apply factors, multiples, prime, and composite numbers in a variety of problem-solving situations (e.g., build rectangular arrays for numbers 1–100 and classify as prime or composite)	3	LG	
8N.5(c) Recognize or use prime and composite numbers to solve problems.	5-NS-2.2b Identify and apply factors, multiples, prime, and composite numbers in a variety of problem-solving situations (e.g., build rectangular arrays for numbers 1–100 and classify as prime or composite)	3	LG	
8N.5(d) Use divisibility or remainders in problem settings.		1		
8N.5(e) Apply basic properties of operations.	7-AR-1.1 Identify and apply the commutative, associative, distributive, inverse, and identity properties (e.g., $n + 0 = n$, $2(x + 3) = 2x + 6$)	3	LG	
8N.6 Mathematical reasoning using numbers				
8N.6(a) Explain or justify a mathematical concept or relationship (e.g., explain why 17 is prime).		1		
8N.6(b) Provide a mathematical argument to explain operations with two or more fractions.		1		
Measurement				
8M.1 Measuring physical attributes				
8M.1(b) Compare objects with respect to length, area, volume, angle measurement, weight, or mass.		1		
8M.1(c) Estimate the size of an object with respect to a given measurement attribute (e.g., area).	7-ME-4.1a Develop area and perimeter concepts (e.g., use grids to estimate the area of irregular shapes)	3	LG	
8M.1(e) Select or use appropriate measurement instrument to determine or create a given length, area, volume, angle, weight, or mass.	7-ME-4.2a Select and use appropriate tools for measurements in practical applications and make reasonable estimates of measurements in a particular situation using the appropriate unit	3	LG	

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TABLE B1 (CONTINUED)

Alignment of National Assessment of Educational Progress (NAEP) grade 8 mathematics and Oklahoma Core Curriculum Tests assessment standards, March 2008

NAEP assessment standards	Oklahoma assessment standards	Overall rating ^a	Code ^b	Notes
Measurement				
8M.1 Measuring physical attributes				
8M.1(f) Solve mathematical or real-world problems involving perimeter or area of plane figures such as triangles, rectangles, circles or composite figures.	7-ME-4.1a Develop area and perimeter concepts (e.g., use grids to estimate the area of irregular shapes) 7-ME-4.1b Apply formulas to solve problems involving perimeter (circumference) and area of polygons and circles	2	LG IC	
8M.1(h) Solve problems involving volume or surface area of rectangular solids, cylinders, prisms, or composite shapes.	8-ME-4.1 Estimate and find the surface area and volume in real world settings (e.g., unwrap a box to explore surface area; use rice, 1-inch cubes, centimeter cubes, cups . . . to estimate the volume of boxes, irregular shaped objects, containers)	3		
8M.1(i) Solve problems involving rates such as speed or population density.	8-ME-4.3a Select and apply appropriate formulas for given situations: I. An equation (e.g., $d = rt$, $I = prt$) II. Measurement problems (e.g., $p = 2l + 2w$, $v = lwh$)	2	IC	
8M.2 Systems of measurement				
8M.2(a) Select or use appropriate type of unit for the attribute being measured such as length, area, angle, time, or volume.	7-ME-4.2a Select and use appropriate tools for measurements in practical applications and make reasonable estimates of measurements in a particular situation using the appropriate unit	3	LG	
8M.2(b) Solve problems involving conversions within the same measurement system such as conversions involving square inches and square feet.	6-ME-4.2 Compare and convert units within the same measurement system; express conversions using appropriate unit labels (e.g., square inches to square feet, centimeters to millimeters, hours to minutes); and compute measurements of combined units (e.g., $9'8" + 3'6" = ?'$ and $?"$, $150 \text{ minutes} = ? \text{ hours and } ? \text{ minutes}$)	3	LG	
8M.2(c) Estimate the measure of an object in one system given the measure of that object in another system and the approximate conversion factor. For example: • Distance conversion: 1 kilometer is approximately $\frac{5}{8}$ of a mile. • Money conversion: U.S. dollar is approximately 1.5 Canadian dollars. • Temperature conversion: Fahrenheit to Celsius	7-ME-4.2b Use estimates to relate customary and metric measurements to each other	3	LG	

(CONTINUED)

TABLE B1 (CONTINUED)

Alignment of National Assessment of Educational Progress (NAEP) grade 8 mathematics and Oklahoma Core Curriculum Tests assessment standards, March 2008

NAEP assessment standards	Oklahoma assessment standards	Overall rating ^a	Code ^b	Notes
Measurement				
8M.2 Systems of measurement				
8M.2(d) Determine appropriate size of unit of measurement in problem situation involving such attributes as length, area, or volume.	7-ME-4.2a Select and use appropriate tools for measurements in practical applications and make reasonable estimates of measurements in a particular situation using the appropriate unit	3	LG	
8M.2(e) Determine appropriate accuracy of measurement in problem situations (e.g., the accuracy of each of several lengths needed to obtain a specified accuracy of a total length) and find the measure to that degree of accuracy.	7-ME-4.2a Select and use appropriate tools for measurements in practical applications and make reasonable estimates of measurements in a particular situation using the appropriate unit	2	LG IC	
8M.3 Measurement in triangles				
8M.3(a) Solve problems involving indirect measurement such as finding the height of a building by comparing its shadow with the height and shadow of a known object.	8-ME-4.2 Apply knowledge of ratio and proportion to solve relationships between similar geometric figures (e.g., build a model of a 3-dimensional object to scale)	2	IC	The grade 8 Oklahoma assessment standard solves relationships while the NAEP solves problems
Geometry				
8G.1 Dimension and shape				
8G.1(a) Draw or describe a path of shortest length between points to solve problems in context.	8-GE-3.2 Develop the Pythagorean Theorem and apply the formula to find the length of missing sides of a right triangle and the length of other line segments	2	IC	This grade 8 Oklahoma assessment standard does not specify drawing or describing in context
8G.1(b) Identify a geometric object given a written description of its properties.	8-GE-3.1 Construct models, sketch (from different perspectives), and classify solid figures such as rectangular solids, prisms, cones, cylinders, pyramids, and combined forms (e.g., draw a figure that could result from making 1, 2, or 3 cuts in a given solid)	2	IC	This grade 8 Oklahoma assessment standard does not specify written descriptions
8G.1(c) Identify, define, or describe geometric shapes in the plane and in three-dimensional space given a visual representation.	8-GE-3.1 Construct models, sketch (from different perspectives), and classify solid figures such as rectangular solids, prisms, cones, cylinders, pyramids, and combined forms (e.g., draw a figure that could result from making 1, 2, or 3 cuts in a given solid)	2	IC	

(CONTINUED)

TABLE B1 (CONTINUED)

Alignment of National Assessment of Educational Progress (NAEP) grade 8 mathematics and Oklahoma Core Curriculum Tests assessment standards, March 2008

NAEP assessment standards	Oklahoma assessment standards	Overall rating ^a	Code ^b	Notes
Geometry				
8G.1 Dimension and shape				
8G.1(d) Draw or sketch from a written description polygons, circles, or semicircles.	8-GE-3.1 Construct models, sketch (from different perspectives), and classify solid figures such as rectangular solids, prisms, cones, cylinders, pyramids, and combined forms (e.g., draw a figure that could result from making 1, 2, or 3 cuts in a given solid)	2	IC	
8G.1(e) Represent or describe a three-dimensional situation in a two-dimensional drawing from different views.	G-PF-4.3 Create a model of a 3-dimensional figure from a 2-dimensional drawing and make a 2-dimensional representation of a 3-dimensional object (for example, nets, blueprints, perspective drawings)	2	HG	
8G.1(f) Demonstrate an understanding about the two- and three-dimensional shapes in our world through identifying, drawing, modeling, building, or taking apart.	8-GE-3.1 Construct models, sketch (from different perspectives), and classify solid figures such as rectangular solids, prisms, cones, cylinders, pyramids, and combined forms (e.g., draw a figure that could result from making 1, 2, or 3 cuts in a given solid) 8-ME-4.1 Estimate and find the surface area and volume in real world settings (e.g., unwrap a box to explore surface area; use rice, 1-inch cubes, centimeter cubes, cups . . . to estimate the volume of boxes, irregular shaped objects, containers)	3		
8G.2(a) Identify lines of symmetry in plane figures or recognize and classify types of symmetries of plane figures.	5-GM-4.1 Identify and describe the basic properties of figures (e.g., two or three-dimensionality, symmetry, number of faces, types of angles)	2	LG IC	
8G.2 Transformation of shapes and preservation of properties				
8G.2(c) Recognize or informally describe the effect of a transformation on two-dimensional geometric shapes (reflections across lines of symmetry, rotations, translations, magnifications, and contractions).	7-GE-3.3b Identify geometric transformation of figures (rotations, translations, and reflections)	3	LG	

(CONTINUED)

TABLE B1 (CONTINUED)

Alignment of National Assessment of Educational Progress (NAEP) grade 8 mathematics and Oklahoma Core Curriculum Tests assessment standards, March 2008

NAEP assessment standards	Oklahoma assessment standards	Overall rating ^a	Code ^b	Notes
Geometry				
8G.2 Transformation of shapes and preservation of properties				
8G.2(d) Predict results of combining, subdividing, and changing shapes of plane figures and solids (e.g., paper folding, tiling, and cutting up and rearranging pieces).	8-GE-3.1 Construct models, sketch (from different perspectives), and classify solid figures such as rectangular solids, prisms, cones, cylinders, pyramids, and combined forms (e.g., draw a figure that could result from making 1, 2, or 3 cuts in a given solid)	2	IC	The example in the grade 8 Oklahoma assessment standard fits the NAEP assessment standard better than the Oklahoma assessment standard
8G.2(e) Justify relationships of congruence and similarity, and apply these relationships using scaling and proportional reasoning.	8-ME-4.2 Apply knowledge of ratio and proportion to solve relationships between similar geometric figures (e.g., build a model of a 3-dimensional object to scale)	2	IC	
8G.2(f) For similar figures, identify and use the relationships of conservation of angle and of proportionality of side length and perimeter.	8-ME-4.2 Apply knowledge of ratio and proportion to solve relationships between similar geometric figures (e.g., build a model of a 3-dimensional object to scale)	2	MC	This grade 8 Oklahoma assessment standard does not include conservation of angles
8G.3 Relationships between geometric figures				
8G.3(b) Apply geometric properties and relationships in solving simple problems in two and three dimensions.	8-ME-4.2 Apply knowledge of ratio and proportion to solve relationships between similar geometric figures (e.g., build a model of a 3-dimensional object to scale)	2	IC	
8G.3(c) Represent problem situations with simple geometric models to solve mathematical or real-world problems.		1		
8G.3(d) Use the Pythagorean theorem to solve problems.	8-GE-3.2 Develop the Pythagorean Theorem and apply the formula to find the length of missing sides of a right triangle and the length of other line segments	3		
8G.3(f) Describe or analyze simple properties of, or relationships between, triangles, quadrilaterals, and other polygonal plane figures.	7-GE-3.1a Classify triangles according to their sides and angles 7-GE-3.1b Classify quadrilaterals according to their sides and angles (e.g., determine whether all squares are rectangles)	2	LG MC	
8G.3(g) Describe or analyze properties and relationships of parallel or intersecting lines.	7-GE-3.2 Identify and compare bisectors, interior, exterior, and vertical angles (e.g., using graph paper, software, protractors to measure angles between parallel lines with a transversal)	2	LG MC	

(CONTINUED)

TABLE B1 (CONTINUED)

Alignment of National Assessment of Educational Progress (NAEP) grade 8 mathematics and Oklahoma Core Curriculum Tests assessment standards, March 2008

NAEP assessment standards	Oklahoma assessment standards	Overall rating ^a	Code ^b	Notes
Geometry				
8G.4 Position, direction, and coordinate geometry				
8G.4(a) Describe relative positions of points and lines using the geometric ideas of midpoint, points on common line through a common point, parallelism, or perpendicularity.	G-CG-5.1 Use coordinate geometry to find the distance between two points; the midpoint of a segment; and to calculate the slopes of parallel, perpendicular, horizontal, and vertical lines	2	HG	
8G.4(b) Describe the intersection of two or more geometric figures in the plane (e.g., intersection of a circle and a line).		1		
8G.4(c) Visualize or describe the cross section of a solid.	8-GE-3.1 Construct models, sketch (from different perspectives), and classify solid figures such as rectangular solids, prisms, cones, cylinders, pyramids, and combined forms (e.g., draw a figure that could result from making 1, 2, or 3 cuts in a given solid)	2	IC	
8G.4(d) Represent geometric figures using rectangular coordinates on a plane.	G-CG-5.2a Given a set of points determine the type of figure formed based on its properties	2	HG	
8G.5 Mathematical reasoning in geometry				
8G.5(a) Make and test a geometric conjecture about regular polygons.		1		
Data analysis, statistics, and probability				
8P.1 Data representation				
The following representations of data are indicated for each grade level. Objectives in which only a subset of these representations is applicable are indicated in the parentheses associated with the objective: histograms, line graphs, scatter plots, box plots, circle graphs, stem and leaf plots, frequency distributions, tables, and bar graphs.				
8P.1(a) Read or interpret data, including interpolating or extrapolating from data.	6-DS-5.2 Construct and interpret graphs of statistical data (e.g., explain how different representations lead to different interpretations and may distort information)	3	LG	
8P.1(b) For a given set of data, complete a graph and then solve a problem using the data in the graph (histograms, line graphs, scatter plots, circle graphs, and bar graphs).	8-DS-5.1 Select and apply appropriate formats (e.g., line plots, bar graphs, stem-and-leaf plots, scatter plots, histograms, circle graphs) to display collected data	2	MC	This grade 8 Oklahoma assessment standard does not specify solving problems
8P.1(c) Solve problems by estimating and computing with data from a single set or across sets of data.	6-DS-5.1 Collect, organize, and interpret data to solve problems (e.g., data from student experiments, tallies, Venn diagrams, tables, circle and bar graphs, spreadsheets)	3	LG	

(CONTINUED)

TABLE B1 (CONTINUED)

Alignment of National Assessment of Educational Progress (NAEP) grade 8 mathematics and Oklahoma Core Curriculum Tests assessment standards, March 2008

NAEP assessment standards	Oklahoma assessment standards	Overall rating ^a	Code ^b	Notes
Data analysis, statistics, and probability				
8P.1 Data representation				
8P.1(d) Given a graph or a set of data, determine whether information is represented effectively and appropriately (histograms, line graphs, scatter plots, circle graphs, and bar graphs).	8-DS-5.1 Select and apply appropriate formats (e.g., line plots, bar graphs, stem-and-leaf plots, scatter plots, histograms, circle graphs) to display collected data	2	IC	
8P.1(e) Compare and contrast the effectiveness of different representations of the same data.	8-DS-5.1 Select and apply appropriate formats (e.g., line plots, bar graphs, stem-and-leaf plots, scatter plots, histograms, circle graphs) to display collected data	2	IC	
8P.2 Characteristics of data sets				
8P.2(a) Calculate, use, or interpret mean, median, mode, or range.	8-DS-5.2a Find the measures of central tendency (mean, median and mode) of a set of data and understand why a specific measure provides the most useful information in a given context	2	IC	This grade 8 Oklahoma assessment standard does not include range
8P.2(b) Describe how mean, median, mode, range, or interquartile ranges relate to the shape of the distribution.		1		
8P.2(c) Identify outliers and determine their effect on mean, median, mode, or range.	8-DS-5.2b Compute the mean, median, and mode for data sets and understand how additional data in a set may affect the measures of central tendency	3		
8P.2(d) Using appropriate statistical measures, compare two or more data sets describing the same characteristic for two different populations or subsets of the same population.	8-DS-5.2b Compute the mean, median, and mode for data sets and understand how additional data in a set may affect the measures of central tendency	2	IC	
8P.2(e) Visually choose the line that best fits given a scatter plot and informally explain the meaning of the line. Use the line to make predictions.	AI-DA-3.2 Collect data involving two variables and display on a scatter plot; interpret results using a linear model/equation and identify whether the model/equation is a line best fit for the data	2	HG	
8P.3 Experiments and samples				
8P.3(a) Given a sample, identify possible sources of bias in sampling.		1		
8P.3(b) Distinguish between a random and non-random sample.		1		

(CONTINUED)

TABLE B1 (CONTINUED)

Alignment of National Assessment of Educational Progress (NAEP) grade 8 mathematics and Oklahoma Core Curriculum Tests assessment standards, March 2008

NAEP assessment standards	Oklahoma assessment standards	Overall rating ^a	Code ^b	Notes
Data analysis, statistics, and probability				
8P.3 Experiments and samples				
8P.3(d) Evaluate the design of an experiment.		1		
8P.4 Probability				
8P.4(a) Analyze a situation that involves probability of an independent event.	7-DP-5.2 Determine the probability of an event involving “or”, “and”, or “not” (e.g., on a spinner with 1 blue, 3 red, and 2 yellow sections what is the probability of getting a red or a yellow?)	3	LG	
8P.4(b) Determine the theoretical probability of simple and compound events in familiar contexts.	7-DP-5.1 Use data from a sample to predict possible outcomes and predict simple probabilities as fractions, decimals, or percents (e.g., the data from lists, tree diagrams, frequency distribution tables, area models) 7-DP-5.3 Find all possible combinations and permutations involving a limited number of variables	2	LG IC	
8P.4(c) Estimate the probability of simple and compound events through experimentation or simulation.	7-DP-5.1 Use data from a sample to predict possible outcomes and predict simple probabilities as fractions, decimals, or percents (e.g., the data from lists, tree diagrams, frequency distribution tables, area models) 7-DP-5.3 Find all possible combinations and permutations involving a limited number of variables	2	LG IC	
8P.4(d) Use theoretical probability to evaluate or predict experimental outcomes.	7-DP-5.1 Use data from a sample to predict possible outcomes and predict simple probabilities as fractions, decimals, or percents (e.g., the data from lists, tree diagrams, frequency distribution tables, area models) 7-DP-5.2 Determine the probability of an event involving “or”, “and”, or “not” (e.g., on a spinner with 1 blue, 3 red, and 2 yellow sections what is the probability of getting a red or a yellow?)	3	LG	

(CONTINUED)

TABLE B1 (CONTINUED)

Alignment of National Assessment of Educational Progress (NAEP) grade 8 mathematics and Oklahoma Core Curriculum Tests assessment standards, March 2008

NAEP assessment standards	Oklahoma assessment standards	Overall rating ^a	Code ^b	Notes
Data analysis, statistics, and probability				
8P.4 Probability				
8P.4(e) Determine the sample space for a given situation.	7-DP-5.1 Use data from a sample to predict possible outcomes and predict simple probabilities as fractions, decimals, or percents (e.g., the data from lists, tree diagrams, frequency distribution tables, area models) 7-DP-5.3 Find all possible combinations and permutations involving a limited number of variables	3	LG	
8P.4(f) Use a sample space to determine the probability of the possible outcomes of an event.	7-DP-5.1 Use data from a sample to predict possible outcomes and predict simple probabilities as fractions, decimals, or percents (e.g., the data from lists, tree diagrams, frequency distribution tables, area models) 7-DP-5.3 Find all possible combinations and permutations involving a limited number of variables	3	LG	
8P.4(g) Represent probability of a given outcome using fractions, decimals, and percents.	7-DP-5.1 Use data from a sample to predict possible outcomes and predict simple probabilities as fractions, decimals, or percents (e.g., the data from lists, tree diagrams, frequency distribution tables, area models)	3	LG	
8P.4(h) Determine the probability of independent and dependent events. (Dependent events should be limited to linear functions with a small sample size.)	7-DP-5.2 Determine the probability of an event involving “or”, “and”, or “not” (e.g., on a spinner with 1 blue, 3 red, and 2 yellow sections what is the probability of getting a red or a yellow?)	3	LG	
8P.4(j) Interpret probabilities within a given context.	7-DP-5.1 Use data from a sample to predict possible outcomes and predict simple probabilities as fractions, decimals, or percents (e.g., the data from lists, tree diagrams, frequency distribution tables, area models)	2	LG IC	

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TABLE B1 (CONTINUED)

Alignment of National Assessment of Educational Progress (NAEP) grade 8 mathematics and Oklahoma Core Curriculum Tests assessment standards, March 2008

NAEP assessment standards	Oklahoma assessment standards	Overall rating ^a	Code ^b	Notes
Algebra				
8A.1 Patterns, relations, and functions				
8A.1(a) Recognize, describe, or extend numerical and geometric patterns using tables, graphs, words, or symbols.	6-AR-1.1 Extend and create patterns from tables, graphs, rules and number properties and generalize patterns algebraically (e.g., recursive patterns like the Fibonacci numbers, number sequences, prime and composite numbers)	3	LG	
8A.1(b) Generalize a pattern appearing in a numerical sequence or table or graph using words or symbols.	AI-NA-1.1a Translate word phrases and sentences into expressions and equations and vice versa 6-AR-1.1 Extend and create patterns from tables, graphs, rules and number properties and generalize patterns algebraically (e.g., recursive patterns like the Fibonacci numbers, number sequences, prime and composite numbers)	2	HG LG	
8A.1(c) Analyze or create patterns, sequences, or linear functions given a rule.	6-AR-1.1 Extend and create patterns from tables, graphs, rules and number properties and generalize patterns algebraically (e.g., recursive patterns like the Fibonacci numbers, number sequences, prime and composite numbers) AI-RF-2.1a Distinguish between linear and nonlinear data AI-RF-2.1b Distinguish between relations and functions AI-RF-2.1c Identify dependent and independent variables, domain and range AI-RF-2.1d Evaluate a function using tables, equations, or graphs	2	HG LG	
8A.1(e) Identify functions as linear or nonlinear or contrast distinguishing properties of functions from tables, graphs, or equations.	AI-RF-2.1a Distinguish between linear and nonlinear data AI-RF-2.1d Evaluate a function using tables, equations, or graphs	2	HG	
8A.1(f) Interpret the meaning of slope or intercepts in linear functions.	8-AR-1.1b Graph and interpret the solution to linear equations on a number line with one variable and on a coordinate plane with two variables 8-AR-1.1c Predict the effect on the graph of a linear equation when the slope changes (e.g., make predictions from graphs, identify the slope in the equation $y = mx + b$ and relate to a graph)	2	IC	These grade 8 Oklahoma assessment standards do not specify intercepts

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TABLE B1 (CONTINUED)

Alignment of National Assessment of Educational Progress (NAEP) grade 8 mathematics and Oklahoma Core Curriculum Tests assessment standards, March 2008

NAEP assessment standards	Oklahoma assessment standards	Overall rating ^a	Code ^b	Notes
Algebra				
8A.2 Algebraic representations				
8A.2(a) Translate between different representations of linear expressions using symbols, graphs, tables, diagrams, or written descriptions.	AI-DA-3.1a Translate from one representation of data to another and understand that the data can be represented using a variety of tables, graphs, or symbols and that different modes of representation often convey different messages	2	HG IC	
8A.2(b) Analyze or interpret linear relationships expressed in symbols, graphs, tables, diagrams, or written descriptions.	8-AR-1.1b Graph and interpret the solution to linear equations on a number line with one variable and on a coordinate plane with two variables	2	MC	
8A.2(c) Graph or interpret points that are represented by ordered pairs of numbers on a rectangular coordinate system.	8-AR-1.1b Graph and interpret the solution to linear equations on a number line with one variable and on a coordinate plane with two variables	2	IC	
8A.2(d) Solve problems involving coordinate pairs on the rectangular coordinate system.	8-AR-1.1b Graph and interpret the solution to linear equations on a number line with one variable and on a coordinate plane with two variables	2	IC	
8A.2(f) Identify or represent functional relationships in meaningful contexts including proportional, linear, and common non-linear (e.g., compound interest, bacterial growth) in tables, graphs, words, or symbols.	AI-RF-2.1a Distinguish between linear and nonlinear data AI-RF-2.2e Match appropriate equations to a graph or table or situation and vice versa	2	HG IC	
8A.3 Variables, expressions, and operations				
8A.3(b) Write algebraic expressions, equations, or inequalities to represent a situation.	8-AR-1.1a Model, write, and solve 2-step linear equations using a variety of methods 8-AR-1.2a Model, write, and solve 1-step and 2-step linear inequalities with one variable	2	MC	These grade 8 Oklahoma assessment standards do not include algebraic expressions
8A.3(c) Perform basic operations, using appropriate tools, on linear algebraic expressions (including grouping and order of multiple operations involving basic operations, exponents, roots, simplifying, and expanding).	6-AR-1.2 Use substitution and order of operations to simplify and evaluate algebraic expressions (e.g., if $x = 5$ evaluate $2x + 3$) 6-NS-2.5 Simplify numerical expressions with exponents and parentheses using order of operations 7-AR-1.1 Identify and apply the commutative, associative, distributive, inverse, and identity properties (e.g., $n + 0 = n$, $2(x + 3) = 2x + 6$)	3	LG	

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TABLE B1 (CONTINUED)

Alignment of National Assessment of Educational Progress (NAEP) grade 8 mathematics and Oklahoma Core Curriculum Tests assessment standards, March 2008

NAEP assessment standards	Oklahoma assessment standards	Overall rating ^a	Code ^b	Notes
Algebra				
8A.4 Equations and inequalities				
8A.4(a) Solve linear equations or inequalities (e.g., $ax + b = c$ or $ax + b = cx + d$ or $ax + b > c$).	8-AR-1.1a Model, write, and solve 2-step linear equations using a variety of methods 8-AR-1.2a Model, write, and solve 1-step and 2-step linear inequalities with one variable	3		
8A.4(b) Interpret “=” as an equivalence between two expressions and use this interpretation to solve problems.	8-AR-1.1a Model, write, and solve 2-step linear equations using a variety of methods	2	IC	
8A.4(c) Analyze situations or solve problems using linear equations and inequalities with rational coefficients symbolically or graphically (e.g., $ax + b = c$ or $ax + b = cx + d$).	8-AR-1.1a Model, write, and solve 2-step linear equations using a variety of methods 8-AR-1.1b Graph and interpret the solution to linear equations on a number line with one variable and on a coordinate plane with two variables 8-AR-1.2a Model, write, and solve 1-step and 2-step linear inequalities with one variable 8-AR-1.2b Graph and interpret the solution to linear inequalities on a number line with one variable and on a coordinate plane with two variables	3		
8A.4(d) Interpret relationships between symbolic linear expressions and graphs of lines by identifying and computing slope and intercepts (e.g., know in $y = ax + b$, that a is the rate of change and b is the vertical intercept of the graph).	8-AR-1.1b Graph and interpret the solution to linear equations on a number line with one variable and on a coordinate plane with two variables 8-AR-1.1c Predict the effect on the graph of a linear equation when the slope changes (e.g., make predictions from graphs, identify the slope in the equation $y = mx + b$ and relate to a graph)	3		
8A.4(e) Use and evaluate common formulas [e.g., relationship between a circle’s circumference and diameter ($C = \pi d$), distance and time under constant speed].	8-ME-4.3a Select and apply appropriate formulas for given situations: I. an equation (e.g., $d = rt$, $i = prt$) II. measurement problems (e.g., $p = 2l + 2w$, $v = lwh$)	3		The NAEP examples imply a higher level of understanding
8A.5 Mathematical reasoning in algebra				
8A.5(a) Make, validate, and justify conclusions and generalizations about linear relationships.	AI-DA-3.1b Make valid inferences, predictions, and/or arguments based on data from graphs, tables, and charts	2	HG IC	

a. Rating is based on a scale of 1 to 3, where 1 indicates that the OCCT standard or standards do not address the NAEP assessment standard, 2 that the OCCT standard or standards partially address the NAEP assessment standard, and 3 that the OCCT standard or standards fully address or exceed the NAEP

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TABLE B1 (CONTINUED)

Alignment of National Assessment of Educational Progress (NAEP) grade 8 mathematics and Oklahoma Core Curriculum Tests assessment standards, March 2008

assessment standard at the targeted grade level. A NAEP assessment standard is considered to be *fully addressed* by the OCCT standard or standards if all of the content in the NAEP assessment standard is contained in one or more OCCT assessment standards at the same or lower grade level. A NAEP standard is considered to be *partially addressed* by the OCCT assessment standard or standards if the OCCT assessment standard or standards address only one part of the NAEP standard; the NAEP standard contains more content or more detailed content than the OCCT standard or standards or the OCCT assessment standard or standards imply but do not explicitly state the content found in the NAEP assessment standard; there is a matching OCCT assessment standard at a higher grade level than the NAEP; or there is a matching OCCT standard or standards at a lower grade level than the NAEP assessment standard, but it does not address all the content addressed by the NAEP assessment standard.

b. Codes: IC = implied content, LG = content covered at a lower grade level, HG = content covered at a higher grade level, MC = more content, MD = more detailed content.

Source: Expert content reviewers' analysis based on data from National Assessment Governing Board (2007) and Oklahoma State Department of Education (2007d,e,f,g,i).

TABLE B2

Oklahoma Core Curriculum Tests (OCCT) grade 8 assessment standards not covered by the National Assessment of Educational Progress (NAEP) grade 8 assessment standards, March 2008

OCCT standard	Oklahoma assessment standard not covered by NAEP
Number sense	8-NS-2.2a Use the rules of exponents, including integer exponents, to solve problems (e.g., $7^2 * 7^3 = 7^6$)
	8-NS-2.2c Use estimation strategies (e.g., rounding) to describe the magnitude of large numbers and numbers less than one
Measurement	8-ME-4.3b Find the area of a "region of region" for simple composite figures (e.g., area of a rectangular picture frame)

Source: Oklahoma State Department of Education (2007f).

Appendix C

Details on the alignment of the National Assessment of Educational Progress grade 12 assessment standards and the Oklahoma Core Curriculum Tests assessment standards

TABLE C1

Alignment of the National Assessment of Educational Progress (NAEP) grade 12 mathematics and Oklahoma Core Curriculum Tests assessment standards, March 2008

NAEP assessment standards	Oklahoma assessment standards	Overall rating ^a	Code ^b	Notes
Number properties and operations				
12N.1 Number sense				
12N.1(d) Represent, interpret or compare expressions for real numbers, including expressions utilizing exponents and logarithms.	All-NA-1.1a Convert expressions from radical notations to rational exponents and vice versa All-RF-2.5b Apply the inverse relationship between exponential and logarithmic functions to convert from one form to another	2	IC	
12N.1(f) Represent or interpret expressions involving very large or very small numbers in scientific notation.	All-NA-1.1a Convert expressions from radical notations to rational exponents and vice versa All-NA-1.1b Add, subtract, multiply, divide, and simplify radical expressions and expressions containing rational exponents	2	IC	
12N.1(g) Represent, interpret or compare expressions or problem situations involving absolute values.	AI-NA-1.2a Simplify and evaluate linear, absolute value, rational and radical expressions	2	IC	
12N.1(i) Order or compare real numbers, including very large and very small real numbers.	8-NS-2.1a Compare and order rational numbers (positive and negative integers, fractions, decimals) in real-life situations	2	LG MC	This Oklahoma assessment standard does not include irrational numbers
12N.2 Estimation				
12N.2(b) Identify situations where estimation is appropriate, determine the needed degree of accuracy, and analyze* the effect of the estimation method on the accuracy of results.	6-NS-2.3 Estimate solutions to single and multi-step problems using whole numbers, decimals, fractions, and percents and assess whether solutions are reasonable (e.g., $7/8 + 8/9$ is about 2, $0.9 + 0.3$ is about 1) 8-NS-2.2c Use estimation strategies (e.g., rounding) to describe the magnitude of large numbers and numbers less than one	3	LG MC	
12N.2(c) Verify solutions or determine the reasonableness of results in a variety of situations.	6-NS-2.3 Estimate solutions to single and multi-step problems using whole numbers, decimals, fractions, and percents and assess whether solutions are reasonable (e.g., $7/8 + 8/9$ is about 2, $0.9 + 0.3$ is about 1)	3	LG	
12N.2(d) Estimate square or cube roots of numbers less than 1,000 between two whole numbers.	7-NS-2.3c Estimate the square root of a number (e.g., between two consecutive integers)	2	LG MC	This Oklahoma assessment standard does not include cube roots

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TABLE C1 (CONTINUED)

Alignment of the National Assessment of Educational Progress (NAEP) grade 12 mathematics and Oklahoma Core Curriculum Tests assessment standards, March 2008

NAEP assessment standards	Oklahoma assessment standards	Overall rating ^a	Code ^b	Notes
Number properties and operations				
12N.3 Number operations				
12N.3(a) Find integral or simple fractional powers of real numbers.	AI-NA-1.1d Solve two-step and three-step problems using concepts such as rules of exponents, rate, distance, ratio and proportion, and percent All-NA-1.1a Convert expressions from radical notations to rational exponents and vice versa All-NA-1.1b Add, subtract, multiply, divide, and simplify radical expressions and expressions containing rational exponents	3		
12N.3(b) Perform arithmetic operations with real numbers, including common irrational numbers.	All-NA-1.1b Add, subtract, multiply, divide, and simplify radical expressions and expressions containing rational exponents AI-NA-1.2a Simplify and evaluate linear, absolute value, rational and radical expressions	2	IC	The NAEP assessment standard specifies real numbers while the Oklahoma assessment standards refer to expressions
12N.3(c) Perform arithmetic operations with expressions involving absolute value.	AI-NA-1.2a Simplify and evaluate linear, absolute value, rational and radical expressions	3		
12N.3(d) Describe the effect of multiplying and dividing by numbers including the effect of multiplying or dividing a real number by: <ul style="list-style-type: none"> • Zero, or • A number less than zero, or • A number between zero and one, or • One, or • A number greater than one. 	8-NS-2.1b Use the basic operations on rational numbers to solve problems in real-life situations (e.g., describe the effect of multiplying whole numbers by a fraction or a decimal less than 1)	3	LG	
12N.3(f) Solve application problems involving numbers, including rational and common irrationals.	AI-NA-1.1d Solve two-step and three-step problems using concepts such as rules of exponents, rate, distance, ratio and proportion, and percent	2	MC	This Oklahoma assessment standard does not include common irrationals
12N.4 Ratios and proportional reasoning				
12N.4(c) Use proportions to solve problems (including rates of change).	AI-NA-1.1d Solve two-step and three-step problems using concepts such as rules of exponents, rate, distance, ratio and proportion, and percent	3		

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TABLE C1 (CONTINUED)

Alignment of the National Assessment of Educational Progress (NAEP) grade 12 mathematics and Oklahoma Core Curriculum Tests assessment standards, March 2008

NAEP assessment standards	Oklahoma assessment standards	Overall rating ^a	Code ^b	Notes
Number properties and operations				
12N.4 Ratios and proportional reasoning				
12N.4(d) Solve multi-step problems involving percentages, including compound percentages.	AI-NA-1.1d Solve two-step and three-step problems using concepts such as rules of exponents, rate, distance, ratio and proportion, and percent	2	MD	This Oklahoma assessment standard does not specify compound percentages
12N.5 Properties of numbers and operations				
12N.5(c) Solve problems using factors, multiples, or prime factorization.		1		
12N.5(d) Use divisibility or remainders in problem settings.		1		
12N.5(e) Apply basic properties of operations, including conventions about the order of operations.	AI-NA-1.2a Simplify and evaluate linear, absolute value, rational and radical expressions AI-NA-1.2b Simplify polynomials by adding, subtracting, or multiplying	2	IC	
12N.5(f) Recognize properties of the number system—whole numbers, integers, rational numbers, real numbers, and complex numbers—recognize how they are related to each other, and identify examples of each type of number.		1		
12N.6 Mathematical reasoning using numbers				
12N.6(a) Give a mathematical argument to establish the validity of a simple numerical property or relationship.	G-LR-1.1 Identify and use logical reasoning skills (inductive and deductive) to make and test conjectures, formulate counterexamples, and follow logical arguments	2	IC	
12N.6(b) * Analyze or interpret a proof by mathematical induction of a simple numerical relationship.	G-LR-1.1 Identify and use logical reasoning skills (inductive and deductive) to make and test conjectures, formulate counterexamples, and follow logical arguments	2	IC	
Measurement				
12M.1 Measuring physical attributes				
12M.1(b) Determine the effect of proportions and scaling on length, areas and volume.	G-PD-2.4b Use ratios of similar 2-dimensional figures to determine unknown values, such as angles, side lengths, perimeter or circumference, and area G-PF-4.2a Use ratios of similar 3-dimensional figures to determine unknown values, such as angles, side lengths, perimeter or circumference of a face, area of a face, and volume	2	IC	

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TABLE C1 (CONTINUED)

Alignment of the National Assessment of Educational Progress (NAEP) grade 12 mathematics and Oklahoma Core Curriculum Tests assessment standards, March 2008

NAEP assessment standards	Oklahoma assessment standards	Overall rating ^a	Code ^b	Notes
Measurement				
12M.1 Measuring physical attributes				
12M.1(c) Estimate, or compare perimeters or areas of two-dimensional geometric figures.		1		
12M.1(d) Solve problems of angle measure, including those involving triangles or other polygons or parallel lines cut by a transversal.	G-PD-2.2a Use the angle relationships formed by parallel lines cut by a transversal to solve problems G-PD-2.2b Use the angle relationships formed by two lines cut by a transversal to determine if the two lines are parallel and verify, using algebraic and deductive proofs G-PD-2.2c Use relationships between pairs of angles (for example, adjacent, complementary, vertical) to solve problems G-PD-2.3b Apply the interior and exterior angle sum of convex polygons to solve problems, and verify using algebraic and deductive proofs	3		
12M.1(f) Solve problems involving perimeter or area of plane figures such as polygons, circles, or composite figures.	8-ME-4.3b Find the area of a “region of a region” for simple composite figures (e.g., area of a rectangular picture frame G-PD-2.3d Use properties of 2-dimensional figures and side length, perimeter or circumference, and area to determine unknown values and correctly identify the appropriate unit of measure of each	3	LG MC	
12M.1(h) Solve problems by determining, estimating, or comparing volumes or surface areas of three-dimensional figures.	G-PF-4.1b Use properties of 3-dimensional figures; side lengths, perimeter or circumference, and area of a face; and volume, lateral area, and surface area to determine unknown values and correctly identify the appropriate unit of measure of each	2	MC	This Oklahoma assessment standard does not specify estimating or comparing
12M.1(i) Solve problems involving rates such as speed, density, population density, or flow rates.	AI-NA-1.1d Solve two-step and three-step problems using concepts such as rules of exponents, rate, distance, ratio and proportion, and percent	3		

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TABLE C1 (CONTINUED)

Alignment of the National Assessment of Educational Progress (NAEP) grade 12 mathematics and Oklahoma Core Curriculum Tests assessment standards, March 2008

NAEP assessment standards	Oklahoma assessment standards	Overall rating ^a	Code ^b	Notes
Measurement				
12M.2 Systems of measurement				
12M.2(a) Recognize that geometric measurements (length, area, perimeter, and volume) depend on the choice of a unit, and apply such units in expressions, equations, and problem solutions.	G-PD-2.3d Use properties of 2-dimensional figures and side length, perimeter or circumference, and area to determine unknown values and correctly identify the appropriate unit of measure of each G-PF-4.1b Use properties of 3-dimensional figures; side lengths, perimeter or circumference, and area of a face; and volume, lateral area, and surface area to determine unknown values and correctly identify the appropriate unit of measure of each AI-NA-1.1c Use the formulas from measurable attributes of geometric models (perimeter, circumference, area and volume), science, and statistics to solve problems within an algebraic context	2	IC	
12M.2(b) Solve problems involving conversions within or between measurement systems, given the relationship between the units.	6-ME-4.2 Compare and convert units within the same measurement system; express conversions using appropriate unit labels (e.g., square inches to square feet, centimeters to millimeters, hours to minutes); and compute measurements of combined units (e.g., 9'8" + 3'6" = ?' and ?", 150 minutes = ? hours and ? minutes) 7-ME-4.2b Use estimates to relate customary and metric measurements to each other	3	LG	
12M.2(d) Understand that numerical values associated with measurements of physical quantities are approximate, are subject to variation, and must be assigned units of measurement.		1		
12M.2(e) Determine appropriate accuracy of measurement in problem situations (e.g., the accuracy of measurement of the dimensions to obtain a specified accuracy of area) and find the measure to that degree of accuracy.		1		

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TABLE C1 (CONTINUED)

Alignment of the National Assessment of Educational Progress (NAEP) grade 12 mathematics and Oklahoma Core Curriculum Tests assessment standards, March 2008

NAEP assessment standards	Oklahoma assessment standards	Overall rating ^a	Code ^b	Notes
Measurement				
12M.2 Systems of measurement				
12M.2(f) Construct or solve problems involving scale drawings.	G-PF-4.3 Create a model of a 3-dimensional figure from a 2-dimensional drawing and make a 2-dimensional representation of a 3-dimensional object (for example, nets, blueprints, perspective drawings) G-PF-4.2a Use ratios of similar 3-dimensional figures to determine unknown values, such as angles, side lengths, perimeter or circumference of a face, area of a face, and volume G-PD-2.4b Use ratios of similar 2-dimensional figures to determine unknown values, such as angles, side lengths, perimeter or circumference, and area	2	IC	The Oklahoma assessment standard “8-ME-4.2 Apply knowledge of ratio and proportion to solve relationships between similar geometric figures (e.g., build a model of a three-dimensional object to scale)” is also a good match
12M.3 Measurement in triangles				
12M.3(a) Solve problems involving indirect measurement.	G-PF-4.2a Use ratios of similar 3-dimensional figures to determine unknown values, such as angles, side lengths, perimeter or circumference of a face, area of a face, and volume G-PD-2.4b Use ratios of similar 2-dimensional figures to determine unknown values, such as angles, side lengths, perimeter or circumference, and area G-TT-3.3 Express the trigonometric functions as ratios and use sine, cosine, and tangent ratios to solve real-world problems	2	IC	
12M.3(b) Solve problems using the fact that trigonometric ratios (sine, cosine, and tangent) stay constant in similar triangles.	G-TT-3.3 Express the trigonometric functions as ratios and use sine, cosine, and tangent ratios to solve real-world problems	3		
12M.3(c) Use the definitions of sine, cosine, and tangent as ratios of sides in a right triangle to solve problems about length of sides and measure of angles.	G-TT-3.3 Express the trigonometric functions as ratios and use sine, cosine, and tangent ratios to solve real-world problems	3		
12M.3(d) Interpret and use the identity $\sin^2 q + \cos^2 q = 1$ for angles q between 0° and 90° ; recognize this identity as a special representation of the Pythagorean theorem.		1		

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TABLE C1 (CONTINUED)

Alignment of the National Assessment of Educational Progress (NAEP) grade 12 mathematics and Oklahoma Core Curriculum Tests assessment standards, March 2008

NAEP assessment standards	Oklahoma assessment standards	Overall rating ^a	Code ^b	Notes
Measurement				
12M.3 Measurement in triangles				
12M.3(e) * Determine the radian measure of an angle and explain how radian measurement is related to a circle of radius 1.		1		
12M.3(f) * Use trigonometric formulas such as addition and double angle formulas.		1		
12M.3(g) * Use the law of cosines and the law of sines to find unknown sides and angles of a triangle.		1		
Geometry				
12G.1 Dimension and shape				
12G.1(c) Give precise mathematical descriptions or definitions of geometric shapes in the plane and in three-dimensional space.	G-PF-4.3 Create a model of a 3-dimensional figure from a 2-dimensional drawing and make a 2-dimensional representation of a 3-dimensional object (for example, nets, blueprints, perspective drawings)	2	MC	This assessment standard does not include solving problems
12G.1(d) Draw or sketch from a written description plane figures and planar images of three-dimensional figures.	G-PD-2.3a Identify, describe, and analyze polygons (for example, convex, concave, regular, pentagonal, hexagonal, n-gonal) G-PF-4.1a Identify, describe, and analyze polyhedra (for example, regular, decahedral)	3		
12G.1(e) Use two-dimensional representations of three-dimensional objects to visualize and solve problems.	G-PF-4.3 Create a model of a 3-dimensional figure from a 2-dimensional drawing and make a 2-dimensional representation of a 3-dimensional object (for example, nets, blueprints, perspective drawings)	2	IC	This assessment standard does not specify drawing or sketching from a written description
12G.1(f) Analyze properties of three-dimensional figures including spheres and hemispheres.	G-PF-4.1a Identify, describe, and analyze polyhedra (for example, regular, decahedral)	2	MC	This assessment standard does not specify spheres and hemispheres
12G.2 Transformation of shapes and preservation of properties				
12G.2(a) Recognize or identify types of symmetries (e.g., point, line, rotational, self-congruence) of two- and three-dimensional figures.	5-GM-4.1 Identify and describe the basic properties of figures (e.g., two or three-dimensionality, symmetry, number of faces, types of angles) 7-GE-3.3b Identify geometric transformation of figures (rotations, translations, and reflections)	3	LG	

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TABLE C1 (CONTINUED)

Alignment of the National Assessment of Educational Progress (NAEP) grade 12 mathematics and Oklahoma Core Curriculum Tests assessment standards, March 2008

NAEP assessment standards	Oklahoma assessment standards	Overall rating ^a	Code ^b	Notes
Geometry				
12G.2 Transformation of shapes and preservation of properties				
12G.2(b) Give or recognize the precise mathematical relationship (e.g., congruence, similarity, orientation) between a figure and its image under a transformation.	G-CG-5.2b Use transformations (reflection, rotation, translation) on geometric figures to solve problems within coordinate geometry	2	MD	This Oklahoma assessment standard is specific to problems within coordinate geometry
12G.2(c) Perform or describe the effect of a single transformation on two- and three-dimensional geometric shapes (reflections across lines of symmetry, rotations, translations, and dilations).	G-CG-5.2b Use transformations (reflection, rotation, translation) on geometric figures to solve problems within coordinate geometry	2	IC	This Oklahoma assessment standard is specific to problems within coordinate geometry
12G.2(d) Identify transformations, combinations or subdivisions of shapes that preserve the area of two-dimensional figures or the volume of three-dimensional figures.		1		
12G.2(e) Justify relationships of congruence and similarity, and apply these relationships using scaling and proportional reasoning.	G-CG-5.2b Use transformations (reflection, rotation, translation) on geometric figures to solve problems within coordinate geometry	2	IC	This Oklahoma assessment standard is specific to problems within coordinate geometry
12G.2(g) Perform or describe the effects of successive transformations.	G-PD-2.4a Determine and verify the relationships of similarity of triangles, using algebraic and deductive proofs G-PD-2.4b Use ratios of similar 2-dimensional figures to determine unknown values, such as angles, side lengths, perimeter or circumference, and area G-PD-2.5a Determine and verify the relationships of congruency of triangles, using algebraic and deductive proofs G-PD-2.5b Use the relationships of congruency of 2-dimensional figures to determine unknown values, such as angles, side lengths, perimeter or circumference, and area	3		

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TABLE C1 (CONTINUED)

Alignment of the National Assessment of Educational Progress (NAEP) grade 12 mathematics and Oklahoma Core Curriculum Tests assessment standards, March 2008

NAEP assessment standards	Oklahoma assessment standards	Overall rating ^a	Code ^b	Notes
Geometry				
12G.3 Relationships between geometric figures				
12G.3(b) Apply geometric properties and relationships to solve problems in two and three dimensions.	G-PD-2.3c Develop and apply the properties of quadrilaterals to solve problems (for example, rectangles, parallelograms, rhombi, trapezoids, kites) G-PD-2.3d Use properties of 2-dimensional figures and side length, perimeter or circumference, and area to determine unknown values and correctly identify the appropriate unit of measure of each G-PD-2.5b Use the relationships of congruency of 2-dimensional figures to determine unknown values, such as angles, side lengths, perimeter or circumference, and area G-PF-4.1b Use properties of 3-dimensional figures; side lengths, perimeter or circumference, and area of a face; and volume, lateral area, and surface area to determine unknown values and correctly identify the appropriate unit of measure of each G-PF-4.2b Use the relationships of congruency of 3-dimensional figures to determine unknown values, such as angles, side lengths, perimeter or circumference of a face, area of a face, and volume	3		
12G.3(c) Represent problem situations with geometric models to solve mathematical or real world problems.		1		
12G.3(d) Use the Pythagorean theorem to solve problems in two- or three-dimensional situations.	G-TT-3.1 Use the Pythagorean Theorem and its converse to find missing side lengths and to determine acute, right, and obtuse triangles, and verify using algebraic and deductive proofs	2	MC	This assessment standard does not specify three-dimensional situations

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TABLE C1 (CONTINUED)

Alignment of the National Assessment of Educational Progress (NAEP) grade 12 mathematics and Oklahoma Core Curriculum Tests assessment standards, March 2008

NAEP assessment standards	Oklahoma assessment standards	Overall rating ^a	Code ^b	Notes
Geometry				
12G.3 Relationships between geometric figures				
12G.3(e) Recall and interpret definitions and basic properties of congruent and similar triangles, circles, quadrilaterals, polygons, parallel, perpendicular and intersecting lines, and associated angle relationships.	G-PD-2.2a Use the angle relationships formed by parallel lines cut by a transversal to solve problems G-PD-2.2c Use relationships between pairs of angles (for example, adjacent, complementary, vertical) to solve problems G-PD-2.3b Apply the interior and exterior angle sum of convex polygons to solve problems, and verify using algebraic and deductive proofs G-PD-2.3c Develop and apply the properties of quadrilaterals to solve problems (for example, rectangles, parallelograms, rhombi, trapezoids, kites) G-PD-2.4a Determine and verify the relationships of similarity of triangles, using algebraic and deductive proofs G-PD-2.5a Determine and verify the relationships of congruency of triangles, using algebraic and deductive proofs G-PD-2.6a Find angle measures and arc measures related to circles G-PD-2.6b Find angle measures and segment lengths using the relationships among radii, chords, secants, and tangents of a circle	3		
12G.3(f) Analyze properties or relationships of triangles, quadrilaterals, and other polygonal plane figures.	G-PD-2.5a Determine and verify the relationships of congruency of triangles, using algebraic and deductive proofs G-PD-2.4a Determine and verify the relationships of similarity of triangles, using algebraic and deductive proofs G-PD-2.3a Identify, describe, and analyze polygons (for example, convex, concave, regular, pentagonal, hexagonal, n-gonal) G-PD-2.3c Develop and apply the properties of quadrilaterals to solve problems (for example, rectangles, parallelograms, rhombi, trapezoids, kites)	3		
12G.3(g) Analyze properties and relationships of parallel, perpendicular, or intersecting lines, including the angle relationships that arise in these cases.	G-PD-2.2a Use the angle relationships formed by parallel lines cut by a transversal to solve problems G-PD-2.2b Use the angle relationships formed by two lines cut by a transversal to determine if the two lines are parallel and verify, using algebraic and deductive proofs G-PD-2.2c Use relationships between pairs of angles (for example, adjacent, complementary, vertical) to solve problems	2	MC	These Oklahoma assessment standards do not specify perpendicular lines

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TABLE C1 (CONTINUED)

Alignment of the National Assessment of Educational Progress (NAEP) grade 12 mathematics and Oklahoma Core Curriculum Tests assessment standards, March 2008

NAEP assessment standards	Oklahoma assessment standards	Overall rating ^a	Code ^b	Notes
Geometry				
12G.3 Relationships between geometric figures				
12G.3(h) Analyze properties of circles and the intersections of lines and circles (inscribed angles, central angles, tangents, secants, chords).	G-PD-2.6a Find angle measures and arc measures related to circles G-PD-2.6b Find angle measures and segment lengths using the relationships among radii, chords, secants, and tangents of a circle	3		
12G.4 Position, direction, and coordinate geometry				
12G.4(a) Solve problems involving the coordinate plane such as the distance between two points, the midpoint of a segment, or slopes of perpendicular or parallel lines.	G-CG-5.1 Use coordinate geometry to find the distance between two points; the midpoint of a segment; and to calculate the slopes of parallel, perpendicular, horizontal, and vertical lines	3		
12G.4(b) Describe the intersections of lines in the plane and in space, intersections of a line and a plane, or of two planes in space.		1		
12G.4(c) Describe or identify conic sections and other cross sections of solids.	All-RF-2.4 Identify, graph, and write the equations of the conic sections (circle, ellipse, parabola, and hyperbola)	3		
12G.4(d) Represent two-dimensional figures algebraically using coordinates and/or equations.	G-CG-5.2a Given a set of points determine the type of figure formed based on its properties All-RF-2.4 Identify, graph, and write the equations of the conic sections (circle, ellipse, parabola, and hyperbola)	3		
12G.4(e) * Use vectors to represent velocity and direction; multiply a vector by a scalar and add vectors both algebraically and graphically.		1		
12G.4(f) Find an equation of a circle given its center and radius and, given an equation of a circle, find its center and radius.	All-RF-2.4 Identify, graph, and write the equations of the conic sections (circle, ellipse, parabola, and hyperbola)	3		
12G.4(g) *Graph ellipses and hyperbolas whose axes are parallel to the coordinate axes and demonstrate understanding of the relationship between their standard algebraic form and their graphical characteristics.	All-RF-2.4 Identify, graph, and write the equations of the conic sections (circle, ellipse, parabola, and hyperbola)	2	MD	
12G.4(h) * Represent situations and solve problems involving polar coordinates.		1		

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TABLE C1 (CONTINUED)

Alignment of the National Assessment of Educational Progress (NAEP) grade 12 mathematics and Oklahoma Core Curriculum Tests assessment standards, March 2008

NAEP assessment standards	Oklahoma assessment standards	Overall rating ^a	Code ^b	Notes
Geometry				
12G.5 Mathematical reasoning in geometry				
12G.5(a) Make, test, and validate geometric conjectures using a variety of methods including deductive reasoning and counterexamples.	G-LR-1.1 Identify and use logical reasoning skills (inductive and deductive) to make and test conjectures, formulate counterexamples, and follow logical arguments G-LR-1.2 State, use, and examine the validity of the converse, inverse, and contrapositive of "if-then" statements	3		
12G.5(b) Determine the role of hypotheses, logical implications, and conclusion, in proofs of geometric theorems.	G-LR-1.1 Identify and use logical reasoning skills (inductive and deductive) to make and test conjectures, formulate counterexamples, and follow logical arguments	2	IC	
12G.5(c) Analyze or explain a geometric argument by contradiction	G-LR-1.2 State, use, and examine the validity of the converse, inverse, and contrapositive of "if-then" statements	2	IC	
12G.5(d) Analyze or explain a geometric proof of the Pythagorean theorem.	G-TT-3.1 Use the Pythagorean Theorem and its converse to find missing side lengths and to determine acute, right, and obtuse triangles, and verify using algebraic and deductive proofs	3		
12G.5(e) Prove basic theorems about congruent and similar triangles and circles.	G-PD-2.5a Determine and verify the relationships of congruency of triangles, using algebraic and deductive proofs G-PD-2.4a Determine and verify the relationships of similarity of triangles, using algebraic and deductive proofs	2	MC	These Oklahoma assessment standards do not include circles
Data analysis, statistics, and probability				
12P.1 Data representation				
The following representations of data are indicated for each grade level. Objectives in which only a subset of these representations is applicable are indicated in the parentheses associated with the objective: histograms, line graphs, scatterplots, box plots, bar graphs, circle graphs, stem and leaf plots, frequency distributions, and tables, including two-way tables.				
12P.1(a) Read or interpret graphical or tabular representations of data.	AI-DA-3.1b Make valid inferences, predictions, and/or arguments based on data from graphs, tables, and charts	3		
12P.1(b) For a given set of data, complete a graph and solve a problem using the data in the graph (histograms, scatterplots, line graphs)	AI-DA-3.2 Collect data involving two variables and display on a scatter plot; interpret results using a linear model/equation and identify whether the model/equation is a line best fit for the data AI-DA-3.1b Make valid inferences, predictions, and/or arguments based on data from graphs, tables, and charts AI-DA-3.1c Solve two-step and three-step problems using concepts such as probability and measures of central tendency	2	IC	

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TABLE C1 (CONTINUED)

Alignment of the National Assessment of Educational Progress (NAEP) grade 12 mathematics and Oklahoma Core Curriculum Tests assessment standards, March 2008

NAEP assessment standards	Oklahoma assessment standards	Overall rating ^a	Code ^b	Notes
Data analysis, statistics, and probability				
12P.1 Data representation				
12P.1(c) Solve problems involving univariate or bivariate data.	AI-DA-3.1b Make valid inferences, predictions, and/or arguments based on data from graphs, tables, and charts AI-DA-3.1c Solve two-step and three-step problems using concepts such as probability and measures of central tendency AI-DA-3.2 Collect data involving two variables and display on a scatter plot; interpret results using a linear model/equation and identify whether the model/equation is a line best fit for the data	2	IC	
12P.1(d) Given a graphical or tabular representation of a set of data, determine whether information is represented effectively and appropriately.	AI-DA-3.1a Translate from one representation of data to another and understand that the data can be represented using a variety of tables, graphs, or symbols and that different modes of representation often convey different messages	3		
12P.1(e) Compare and contrast different graphical representations of univariate and bivariate data.	AI-DA-3.1a Translate from one representation of data to another and understand that the data can be represented using a variety of tables, graphs, or symbols and that different modes of representation often convey different messages	3		
12P.1(f) Organize and display data in a spreadsheet in order to recognize patterns and solve problems.		1		
12P.2 Characteristics of data sets				
12P.2(a) Calculate, interpret, or use summary statistics for distributions of data including measures of typical value (mean, median), position (quartiles, percentiles), and spread (range, interquartile range, variance, standard deviation).	AI-DA-3.1c Solve two-step and three-step problems using concepts such as probability and measures of central tendency	2	MC	
12P.2(b) Recognize how linear transformations of one-variable data affect mean, median, mode, range, interquartile range, and standard deviation.	8-DS-5.2b Compute the mean, median, and mode for data sets and understand how additional data in a set may affect the measures of central tendency	3	LG MC	
12P.2(c) Determine the effect of outliers on mean, median, mode, range, interquartile range, or standard deviation.		1		

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TABLE C1 (CONTINUED)

Alignment of the National Assessment of Educational Progress (NAEP) grade 12 mathematics and Oklahoma Core Curriculum Tests assessment standards, March 2008

NAEP assessment standards	Oklahoma assessment standards	Overall rating ^a	Code ^b	Notes
Data analysis, statistics, and probability				
12P.2 Characteristics of data sets				
12P.2(d) Compare data sets using summary statistics (mean, median, mode, range, interquartile range, or standard deviation) describing the same characteristic for two different populations or subsets of the same population.		1		
12P.2(e) Approximate a trend line if a linear pattern is apparent in a scatterplot or use a graphing calculator to determine a least-squares regression line, and use the line or equation to make predictions.	AI-DA-3.2 Collect data involving two variables and display on a scatter plot; interpret results using a linear model/equation and identify whether the model/equation is a line best fit for the data AI-DA-3.1b Make valid inferences, predictions, and/or arguments based on data from graphs, tables, and charts	2	MD	These Oklahoma assessment standards do not include using a graphing calculator
12P.2(f) Recognize that the correlation coefficient is a number from -1 to $+1$ that measures the strength of the linear relationship between two variables; visually estimate the correlation coefficient (e.g., positive or negative, closer to 0, .5, or 1.0) of a scatterplot.		1		
12P.2(g) Know and interpret the key characteristics of a normal distribution such as shape, center (mean), and spread (standard deviation).		1		
12P.3 Experiments and samples				
12P.3(a) Identify possible sources of bias in sample surveys, and describe how such bias can be controlled and reduced.		1		
12P.3(b) Recognize and describe a method to select a simple random sample.		1		
12P.3(c) * Draw inferences from samples, such as estimates of proportions in a population, estimates of population means, or decisions about differences in means for two "treatments".		1		

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TABLE C1 (CONTINUED)

Alignment of the National Assessment of Educational Progress (NAEP) grade 12 mathematics and Oklahoma Core Curriculum Tests assessment standards, March 2008

NAEP assessment standards	Oklahoma assessment standards	Overall rating ^a	Code ^b	Notes
Data analysis, statistics, and probability				
12P.3 Experiments and samples				
12P.3(d) Identify or evaluate the characteristics of a good survey or of a well-designed experiment.		1		
12P.3(e) * Recognize the differences in design and in conclusions between randomized experiments and observational studies.		1		
12P.4 Probability				
12P.4(a) Recognize whether two events are independent or dependent.		1		
12P.4(b) Determine the theoretical probability of simple and compound events in familiar or unfamiliar contexts.	AI-DA-3.1c Solve two-step and three-step problems using concepts such as probability and measures of central tendency	2	IC	
12P.4(c) Given the results of an experiment or simulation, estimate the probability of simple or compound events in familiar or unfamiliar contexts.	AI-DA-3.1c Solve two-step and three-step problems using concepts such as probability and measures of central tendency	2	IC	
12P.4(d) Use theoretical probability to evaluate or predict experimental outcomes.		1		
12P.4(e) Determine the number of ways an event can occur using tree diagrams, formulas for combinations and permutations, or other counting techniques.	AI-DA-3.1c Solve two-step and three-step problems using concepts such as probability and measures of central tendency	2	IC	
12P.4(h) Determine the probability of independent and dependent events.	AI-DA-3.1c Solve two-step and three-step problems using concepts such as probability and measures of central tendency	2	IC	
12P.4(i) Determine conditional probability using two-way tables.		1		
12P.4(j) Interpret and apply probability concepts to practical situations.	AI-DA-3.1c Solve two-step and three-step problems using concepts such as probability and measures of central tendency	2	IC	
12P.4(k) *Use the binomial theorem to solve problems.		1		

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TABLE C1 (CONTINUED)

Alignment of the National Assessment of Educational Progress (NAEP) grade 12 mathematics and Oklahoma Core Curriculum Tests assessment standards, March 2008

NAEP assessment standards	Oklahoma assessment standards	Overall rating ^a	Code ^b	Notes
Data analysis, statistics, and probability				
12P.5 Mathematical reasoning with data				
12P.5(a) Identify misleading uses of data in real-world settings and critique different ways of presenting and using information.	AI-DA-3.1a Translate from one representation of data to another and understand that the data can be represented using a variety of tables, graphs, or symbols and that different modes of representation often convey different messages	2	IC	
12P.5(b) Distinguish relevant from irrelevant information, identify missing information, and either find what is needed or make appropriate approximations.		1		
12P.5(c)* Recognize, use, and distinguish between the processes of mathematical (deterministic) and statistical modeling.		1		
12P.5(d) Recognize when arguments based on data confuse correlation with causation.		1		
12P.5(e) * Recognize and explain the potential errors caused by extrapolating from data.		1		
Algebra				
12A.1 Patterns, relations, and functions				
12A.1(a) Recognize, describe, or extend numerical patterns, including arithmetic and geometric progressions.	All-DS-3.3 Identify and use arithmetic and geometric sequences and series to solve problems	3		
12A.1(b) Express linear and exponential functions in recursive and explicit form given a table, verbal description, or some terms of a sequence.	AI-NA-1.1a Translate word phrases and sentences into expressions and equations and vice versa All-RF-2.5c Model a situation that can be described by an exponential or logarithmic function, and use the model to answer questions about the situation	2	MD	

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TABLE C1 (CONTINUED)

Alignment of the National Assessment of Educational Progress (NAEP) grade 12 mathematics and Oklahoma Core Curriculum Tests assessment standards, March 2008

NAEP assessment standards	Oklahoma assessment standards	Overall rating ^a	Code ^b	Notes
Algebra				
12A.1 Patterns, relations, and functions				
12A.1(e) Identify or analyze distinguishing properties of linear, quadratic, rational, exponential, or *trigonometric functions from tables, graphs, or equations.	AI-RF-2.2d Develop the equation of a line and graph linear relationships given the following: slope and y-intercept, slope and one point on the line, two points on the line, x-intercept and y-intercept, a set of data points AI-RF-2.2e Match appropriate equations to a graph, table, or situation and vice versa All-RF-2.3b Graph a quadratic function and identify the x- and y-intercepts and maximum or minimum value, using various methods and tools which may include a graphing calculator All-RF-2.5a Graph exponential and logarithmic functions All-RF-2.7c Given the graph of a rational function, identify the x- and y-intercepts, asymptotes, using various methods and tools which may include a graphing calculator	2	IC MC	These Oklahoma assessment standards do not specify trigonometric functions
12A.1(g) Determine whether a relation, given in verbal, symbolic, tabular, or graphical form, is a function.	AI-RF-2.1b Distinguish between relations and functions	2	MD	
12A.1(h) Recognize and analyze the general forms of linear, quadratic, rational, exponential, or *trigonometric functions.	AI-RF-2.2b Recognize the parent graph of the functions $y = k$, $y = x$, $y = x $, and predict the effects of transformations on the parent graph All-RF-2.1a Recognize the parent graphs of polynomial, exponential, and logarithmic functions and predict the effects of transformations on the parent graphs, using various methods and tools which may include graphing calculators All-RF-2.3b Graph a quadratic function and identify the x- and y-intercepts and maximum or minimum value, using various methods and tools which may include a graphing calculator All-RF-2.7c Given the graph of a rational function, identify the x- and y-intercepts, asymptotes, using various methods and tools which may include a graphing calculator	2	MC	These Oklahoma assessment standards do not specify trigonometric functions
12A.1(i) Determine the domain and range of functions given in various forms and contexts.	AI-RF-2.1c Identify dependent and independent variables, domain and range All-RF-2.1d Use algebraic, interval, and set notations to specify the domain and range of functions of various types	3		

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TABLE C1 (CONTINUED)

Alignment of the National Assessment of Educational Progress (NAEP) grade 12 mathematics and Oklahoma Core Curriculum Tests assessment standards, March 2008

NAEP assessment standards	Oklahoma assessment standards	Overall rating ^a	Code ^b	Notes
Algebra				
12A.1 Patterns, relations, and functions				
12A.1(j) * Given a function, determine its inverse if it exists, and explain the contextual meaning of the inverse for a given situation.	All-RF-2.1e Find and graph the inverse of a function, if it exists	2	MD	This assessment standard does not specify explaining its contextual meaning
12A.2 Algebraic representations				
12A.2(a) Create and translate between different representations of algebraic expressions, equations, and inequalities (e.g., linear, quadratic, exponential, or *trigonometric) using symbols, graphs, tables, diagrams, or written descriptions.	AI-NA-1.1a Translate word phrases and sentences into expressions and equations and vice versa AI-RF-2.2e Match appropriate equations to a graph, table, or situation and vice versa AI-RF-2.3b Match appropriate inequalities (with 1 or 2 variables) to a graph, table, or situation and vice versa All-RF-2.3b Graph a quadratic function and identify the x- and y-intercepts and maximum or minimum value, using various methods and tools which may include a graphing calculator All-RF-2.5b Apply the inverse relationship between exponential and logarithmic functions to convert from one form to another	2	MC	
12A.2(b) Analyze or interpret relationships expressed in symbols, graphs, tables, diagrams (including Venn diagrams), or written descriptions and evaluate the relative advantages or disadvantages of different representations to answer specific questions.	All-RF-2.2a Model a situation that can be described by a system of equations and inequalities, and use the model to answer questions about the situation All-RF-2.3c Model a situation that can be described by a quadratic function, and use the model to answer questions about the situation All-RF-2.5c Model a situation that can be described by an exponential or logarithmic function, and use the model to answer questions about the situation All-RF-2.6d Model a situation that can be described by a polynomial function, and use the model to answer questions about the situation	2	IC	
12A.2(d) Perform or interpret transformations on the graphs of linear, quadratic, exponential, and *trigonometric functions.	AI-RF-2.2b Recognize the parent graph of the functions $y = k$, $y = x$, $y = x $, and predict the effects of transformations on the parent graph All-RF-2.1a Recognize the parent graphs of polynomial, exponential, and logarithmic functions and predict the effects of transformations on the parent graphs, using various methods and tools which may include graphing calculators	2	MC	These Oklahoma assessment standards do not specify trigonometric functions

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TABLE C1 (CONTINUED)

Alignment of the National Assessment of Educational Progress (NAEP) grade 12 mathematics and Oklahoma Core Curriculum Tests assessment standards, March 2008

NAEP assessment standards	Oklahoma assessment standards	Overall rating ^a	Code ^b	Notes
Algebra				
12A.2 Algebraic representations				
12A.2(e) Make inferences or predictions using an algebraic model of a situation.	AI-DA-3.1b Make valid inferences, predictions, and/or arguments based on data from graphs, tables, and charts AII-RF-2.2a Model a situation that can be described by a system of equations and inequalities, and use the model to answer questions about the situation AII-RF-2.3c Model a situation that can be described by a quadratic function, and use the model to answer questions about the situation AII-RF-2.5c Model a situation that can be described by an exponential or logarithmic function, and use the model to answer questions about the situation AII-RF-2.6d Model a situation that can be described by a polynomial function, and use the model to answer questions about the situation AII-RF-2.7d Model a situation that can be described by a rational function, and use the model to answer questions about the situation	3		
12A.2(f) Given a real-world situation, determine if a linear, quadratic, rational, exponential, logarithmic, or *trigonometric function fits the situation.	AI-RF-2.2e Match appropriate equations to a graph, table, or situation and vice versa AI-DA-3.2 Collect data involving two variables and display on a scatter plot; interpret results using a linear model/equation and identify whether the model/equation is a line best fit for the data AI-DA-3.1b Interpret results using a linear, exponential, or quadratic model/equation AII-RF-2.5c Model a situation that can be described by an exponential or logarithmic function, and use the model to answer questions about the situation AII-RF-2.7d Model a situation that can be described by a rational function, and use the model to answer questions about the situation AII-RF-2.3c Model a situation that can be described by a quadratic function, and use the model to answer questions about the situation	2	MC	These Oklahoma assessment standards do not specify trigonometric functions
12A.2(g) Solve problems involving exponential growth and decay.	AII-RF-2.5c Model a situation that can be described by an exponential or logarithmic function, and use the model to answer questions about the situation	3		

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TABLE C1 (CONTINUED)

Alignment of the National Assessment of Educational Progress (NAEP) grade 12 mathematics and Oklahoma Core Curriculum Tests assessment standards, March 2008

NAEP assessment standards	Oklahoma assessment standards	Overall rating ^a	Code ^b	Notes
Algebra				
12A.2 Algebraic representations				
12A.2(h) * Analyze properties of exponential, logarithmic, and rational functions.	AI-RF-2.1a Distinguish between linear and nonlinear data	2	IC MC	
12A.3 Variables, expressions, and operations				
12A.3(b) Write algebraic expressions, equations, or inequalities to represent a situation.	AI-NA-1.1a Translate word phrases and sentences into expressions and equations and vice versa AI-RF-2.2e Match appropriate equations to a graph, table, or situation and vice versa AI-RF-2.3b Match appropriate inequalities (with 1 or 2 variables) to a graph, table, or situation and vice versa	3		
12A.3(c) Perform basic operations, using appropriate tools, on algebraic expressions including polynomial and rational expressions.	All-NA-1.1b Add, subtract, multiply, divide, and simplify radical expressions and expressions containing rational exponents AI-NA-1.2b Simplify polynomials by adding, subtracting, or multiplying All-NA-1.2a Divide polynomial expressions by lower degree polynomials All-NA-1.2b Add, subtract, multiply, divide, and simplify rational expressions, including complex fractions	3		
12A.3(d) Write equivalent forms of algebraic expressions, equations, or inequalities to represent and explain mathematical relationships.	AI-NA-1.1a Translate word phrases and sentences into expressions and equations and vice versa AI-RF-2.2e Match appropriate equations to a graph, table, or situation and vice versa AI-RF-2.3b Match appropriate inequalities (with 1 or 2 variables) to a graph, table, or situation and vice versa	3		
12A.3(e) Evaluate algebraic expressions, including polynomials and rational expressions.	AI-NA-1.2a Simplify and evaluate linear, absolute value, rational and radical expressions	3		
12A.3(f) Use function notation to evaluate a function at a specified point in its domain and combine functions by addition, subtraction, multiplication, division, and composition.	AI-RF-2.1d Evaluate a function using tables, equations, or graphs All-RF-2.1b Use function notation to add, subtract, multiply, and divide functions All-RF-2.1c Combine functions by composition	3		
12A.3(g) * Determine the sum of finite and infinite arithmetic and geometric series.	All-DS-3.3 Identify and use arithmetic and geometric sequences and series to solve problems	3		

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TABLE C1 (CONTINUED)

Alignment of the National Assessment of Educational Progress (NAEP) grade 12 mathematics and Oklahoma Core Curriculum Tests assessment standards, March 2008

NAEP assessment standards	Oklahoma assessment standards	Overall rating ^a	Code ^b	Notes
Algebra				
12A.3 Variables, expressions, and operations				
12A.3(h) Use basic properties of exponents and *logarithms to solve problems.	AI-NA-1.1d Solve two-step and three-step problems using concepts such as rules of exponents, rate, distance, ratio and proportion, and percent All-RF-2.5b Apply the inverse relationship between exponential and logarithmic functions to convert from one form to another All-RF-2.5c Model a situation that can be described by an exponential or logarithmic function, and use the model to answer questions about the situation	3		
12A.4 Equations and inequalities				
12A.4(a) Solve linear, rational or quadratic equations or inequalities, including those involving absolute value.	All-RF-2.2a Solve linear equations by graphing or using properties of equality All-RF-2.3a Solve linear inequalities by graphing or using properties of inequalities All-RF-2.3a Solve quadratic equations by graphing, factoring, completing the square, and quadratic formula All-RF-2.7a Solve rational equations	2	MC	These Oklahoma assessment standards do not include rational, absolute value, or quadratic inequalities
12A.4(c) Analyze situations, develop mathematical models, or solve problems using linear, quadratic, exponential, or logarithmic equations or inequalities symbolically or graphically.	All-RF-2.2a Solve linear equations by graphing or using properties of equality All-RF-2.3a Solve linear inequalities by graphing or using properties of inequalities All-RF-2.2e Match appropriate equations to a graph, table, or situation and vice versa All-RF-2.3b Match appropriate inequalities (with 1 or 2 variables) to a graph, table, or situation and vice versa All-RF-2.3c Model a situation that can be described by a quadratic function, and use the model to answer questions about the situation All-RF-2.5c Model a situation that can be described by an exponential or logarithmic function, and use the model to answer questions about the situation	2	MC	These Oklahoma assessment standards do not include quadratic, exponential, and logarithmic inequalities

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TABLE C1 (CONTINUED)

Alignment of the National Assessment of Educational Progress (NAEP) grade 12 mathematics and Oklahoma Core Curriculum Tests assessment standards, March 2008

NAEP assessment standards	Oklahoma assessment standards	Overall rating ^a	Code ^b	Notes
Algebra				
12A.4 Equations and inequalities				
12A.4(d) Solve (symbolically or graphically) a system of equations or inequalities and recognize the relationship between the analytical solution and graphical solution.	All-RF-2.2b Solve systems of linear equations and inequalities using various methods and tools which may include substitution, elimination, matrices, graphing, and graphing calculators All-RF-2.2a Model a situation that can be described by a system of equations and inequalities, and use the model to answer questions about the situation All-RF-2.2c Use either one quadratic equation and one linear equation or two quadratic equations to solve problems	3		
12A.4(e) Solve problems involving special formulas such as: $A = P(l + r)t$, $A = Pert$.	AI-NA-1c Use the formulas from measurable attributes of geometric models (perimeter, circumference, area and volume), science, and statistics to solve problems within an algebraic context	2	IC	
12A.4(f) Solve an equation or formula involving several variables for one variable in terms of the others.	AI-NA-1.1b Solve literal equations involving several variables for one variable in terms of the others	3		
12A.4(g) Solve quadratic equations with complex roots.	All-RF-2.3a Solve quadratic equations by graphing, factoring, completing the square, and quadratic formula All-NA-1.3b Add, subtract, multiply, divide, and simplify expressions involving complex numbers	3		
12A.5 Mathematical reasoning in algebra				
12A.5(a) Use algebraic properties to develop a valid mathematical argument.	G-LR-1.1 Identify and use logical reasoning skills (inductive and deductive) to make and test conjectures, formulate counterexamples, and follow logical arguments	2	IC	This assessment standard does not specify using algebraic properties with a mathematical argument
12A.5(b) Determine the role of hypotheses, logical implications, and conclusions in algebraic argument.	G-LR-1.1 Identify and use logical reasoning skills (inductive and deductive) to make and test conjectures, formulate counterexamples, and follow logical arguments	2	IC	This assessment standard does not specify algebraic argument
12A.5(c) Explain the use of relational conjunctions (and, or) in algebraic arguments.		1		

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TABLE C1 (CONTINUED)

Alignment of the National Assessment of Educational Progress (NAEP) grade 12 mathematics and Oklahoma Core Curriculum Tests assessment standards, March 2008

Note: NAEP grade 12 assessment standards marked with an asterisk (*) include content that is beyond what is usually taught in a standard three-year course of study and are selected less often for inclusion in NAEP than other assessment standards" (National Assessment Governing Board 2007a).

a. Rating is based on a scale of 1 to 3, where 1 indicates that the OCCT standard or standards do not address the NAEP assessment standard, 2 that the OCCT standard or standards partially address the NAEP assessment standard, and 3 that the OCCT standard or standards fully address or exceed the NAEP assessment standard at the targeted grade level. A NAEP assessment standard is considered to be *fully addressed* by the OCCT standard or standards if all of the content in the NAEP assessment standard is contained in one or more OCCT assessment standards at the same or lower grade level. A NAEP standard is considered to be *partially addressed* by the OCCT assessment standard or standards if the OCCT assessment standard or standards address only one part of the NAEP standard; the NAEP standard contains more content or more detailed content than the OCCT standard or standards or the OCCT assessment standard or standards imply but do not explicitly state the content found in the NAEP assessment standard; or there is a matching OCCT standard or standards at a lower grade level than the NAEP assessment standard, but it does not address all the content addressed by the NAEP assessment standard.

b. Codes: IC = implied content, LG = content covered at a lower grade level, HG = content covered at a higher grade level, MC = more content, MD = more detailed content.

Source: Expert content reviewers' analysis based on data from National Assessment Governing Board (2007) and Oklahoma State Department of Education (2007c–i).

TABLE C2

Oklahoma Core Curriculum Tests (OCCT) algebra I, algebra II, and geometry assessment standards not covered by the National Assessment of Educational Progress (NAEP) grade 12 assessment standards

OCCT standard	Oklahoma assessment standard not covered by NAEP
Algebra I	
Number sense and algebraic operations	AI-NA-1.2c Factor polynomial expressions
Relations and functions	AI-RF-2.2c Slope I. Calculate the slope of a line using a graph, an equation, two points, or a set of data points II. Use the slope to differentiate between lines that are parallel, perpendicular, horizontal, or vertical III. Interpret the slope and intercepts within the context of everyday life (e.g., telephone charges based on base rate [y-intercept] plus rate per minute [slope])
	AI-RF-2.4 Solve a system of linear equations by graphing, substitution, or elimination
Algebra II	
Relations and functions	AII-RF-2.6a Solve polynomial equations using various methods and tools which may include factoring and synthetic division
	AII-RF-2.6b Sketch the graph of a polynomial function
	AII-RF-2.6c Given the graph of a polynomial function, identify the x- and y-intercepts, relative maximums and relative minimums, using various methods and tools which may include a graphing calculator
Data analysis and statistics	AII-RF-2.7b Sketch the graph of a rational function
	AII-DS-3.1a Display data on a scatter plot AII-DS-3.1b Interpret results using a linear, exponential, or quadratic model/equation AII-DS-3.1c Identify whether the model/equation is a curve of best fit for the data, using various methods and tools which may include a graphing calculator
Geometry	
Triangles and trigonometric ratios	G-TT-3.2 Apply the 45-45-90 and 30-60-90 right triangle relationships to solve problems, and verify using algebraic and deductive proofs

Source: Oklahoma State Department of Education (2007g,h,i).

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