

Transition from the Washington Assessment of Student Learning to the 2010 High School Proficiency Exam

(Updated 11/2009)

The 2010 High School Proficiency Exam (HSPE) will assess the same standards, the Essential Academic Learning Requirements and the Grade Level Expectations, as the Washington Assessment of Student Learning (WASL). Statements that reference the WASL in the Test Specifications for Grade 10 Mathematics and the Item Specifications for Grade 10 Mathematics also apply to the 2010 HSPE.

There are, however, certain notable changes to the assessment that are not reflected in these documents.

1. There will not be any Extended-Response items on the HSPE; the Test and Item specifications make several references to the two-page, extended-response items, used on the WASL, that are no longer used on the state-level mathematics assessments.
2. The total number of each item type and total number of points on the HSPE will not be the same as the WASL; the test map has been changed, with fewer short-answer items on the HSPE than on the WASL, more multiple-choice items on the HSPE than on the WASL, and no extended-response items on the HSPE.
3. The distribution of points on the HSPE will not be the same as on the WASL. As there are no Extended-Response items on the HSPE, there will be fewer total points in the Solves Problems & Reasons Logically and Communicates Understanding areas on the HSPE than on the WASL. The HSPE will reflect a proportional amount of points, compared to the WASL, for the other areas assessed (Number Sense, Measurement, etc.)
4. The HSPE will not be given in two sessions; the HSPE will be given in one, 120-minute session. Students are allowed to use calculators and tools, such as rulers, protractors, and manipulatives, on any of the test items. Although the test is not specifically a timed test, total testing time should be about 3 hours.

**Item Specifications for the
Washington Assessment of Student Learning
Grade 10 Mathematics
July 2004
Updated May 2005**

The purpose of this test is to measure the level of mathematics proficiency that Washington students have achieved based on the Essential Academic Learning Requirements (EALRs). Established in July 1998 by the Washington Commission on Student Learning and refined September 2001, March 2003, and July 2004, the Essential Academic Learning Requirements consist of the mathematics concepts and procedures (number sense, measurement, geometric sense, probability and statistics, and algebraic sense) and four fundamental processes (solves problems, reasons logically, communicates understanding, and makes connections). For assessment purposes, these concepts and procedures and the processes are grouped into the following content and process strands:

Content Strands			Process Strands		
		Page			Page
1. Number Sense	NS	8	6. Solves Problems and Reasons Logically	SR	25
2. Measurement	ME	13	7. Communicates Understanding	CU	30
3. Geometric Sense	GS	17	8. Makes Connections	MC	32
4. Probability and Statistics	PS	19			
5. Algebraic Sense	AS	22			

There are some considerations and procedures that make the task of item development more efficient and effective. These considerations include, but are not limited to, the following:

1. General Considerations

- Students are expected to know all content, vocabulary, and processes in the Item Specifications for all previous grade levels.
- Items attempt to focus on content that is familiar to tenth grade students.
- Item stems and stimulus materials are straightforward and use simple syntax.
- Items use language targeted for a ninth grade or lower readability.
- Items must include language that is unbiased and that will not disadvantage a particular group of students.
- Items do not contain language or representations that might offend or demean any group of students.
- Items should avoid use of “not” or “if” unless it is essential to communicate understanding of the task.
- Items will not test vocabulary definitions.
- Items will not require the use of a particular strategy in estimation, measurement, or problem solving.
- Items will clearly indicate what is expected in a response and must help students focus their responses.
- Complex directions will be organized with bullets to set off multiple requirements.
- Pictorial representations will be realistic and authentic for tenth grade students.
- On items for which tools are allowed or required, students may be given the opportunity to use classroom manipulatives or tools as long as nothing about them would introduce bias into the results.
- Tools may include calculators, protractors, rulers, pattern blocks, base ten blocks, geoboards, algebra tiles, and any other classroom manipulatives.
- Items involving computation will use the following guidelines:

Numbers	Session With Tools	Session Without Tools
Integers	to the thousands place	to the thousands place
Decimals	to the thousandths place, division to the hundredths place	to the thousandths place, division to the hundredths place
Fractions	four fractions	four fractions with denominators 2, 3, 4, 5, 6, 7, 8, 9, 10, 12, 15, 16, 18 20, 24, 25, 36, 50, 100
Powers	through 15^2 or 5^3	through 15^2 or 5^3
Square roots	perfect squares through 225	perfect squares through 225

2. Notational Considerations

- In the item stems, numbers, other than years, having more than three digits to the left of the decimal point will include commas to group digits in the usual manner, e.g., 435,000.
- Standard measurement abbreviations may be used, however, the unit should be spelled out if any confusion is possible, e.g., “inch” rather than “in.”
- Variables are always italicized.
- The variable x will not be used in order to avoid confusion with the multiplication sign.
- The symbols “ \times ” and “ \cdot ” can be used to indicate multiplication.
- The symbol “ \div ” or a horizontal fraction bar can be used to indicate division.
- Fractions will have a horizontal line separating numerator and denominator, e.g., $\frac{1}{2}$.
- Large numbers may be used in certain contexts, such as in a chart or graph, with a heading such as “in millions”.
- Decimals less than one are written with a leading 0, e.g., 0.25 rather than .25.

3. Rules for Stimulus Materials

- Stimulus materials should be clear and simple with a minimum of distracting or irrelevant information unless it is appropriate for the target being assessed.
- Stimulus materials should not “trick” students into choosing or developing an incorrect or ineffective response.
- Stimulus materials will be factually correct.
- Items will focus on what is essential and consequential and will minimize the impact of, or need for, outside knowledge.
- The amount of reading will be kept to a minimum so that each item is clear and precise.
- Character names will be representative of the range of ethnic diversity of Washington students. The names will be short and simple to read.

4. Rules for Multiple-Choice Items

- Each Multiple-Choice item will have a stem (question, statement, or incomplete statement) and four answer or completion options, only one of which is correct.
- Multiple-Choice item stems will present a clear indication of what is required so that students will know what to do before looking at the answer choices.
- The four answer choices will be approximately the same length, will have the same format, and will be syntactically and semantically parallel.
- The answer choices will be arranged in numerical or chronological order or according to length.
- Students should not be able to rule out a distractor (wrong answer choice) or identify the answer simply because of superficial or trivial characteristics, syntactic complexity, or concept complexity.
- Correct answers should not be obtainable through incorrect procedures and gimmicks. For example, “Simplify the fraction $\frac{64}{16}$ ” is a poor item since the correct response can be obtained by “canceling” the two sixes.
- Distractors will reflect common errors or misunderstandings, naïve pre-conceptions, or other misconceptions so that correct responses show what students know or can do rather than simply eliminating incorrect responses because of a distractor’s obviously inappropriate nature.
- Distractors will not be partially correct responses nor will they be designed to “trick” students into responding incorrectly.
- The responses “Both of the above,” “All of the above,” “None of the above,” and “Neither of the above” will not be used.
- The letters A, B, C, and D will be used for answer choices and will not be used as labels within an item.

5. Rules for Short-Answer and Extended-Response Items

- Short-Answer or Extended-Response items will give clear indications of what is required of students; e.g., “Give two words” or “Write an equation.”
- Anything required by the scoring rubric will be asked for in the item.
- Item response spaces will be carefully scaffolded to guide responses. A response that requires multiple parts will be presented with boxes to draw attention to the parts.
- When an item poses a specific question, the question is repeated at the bottom of the workspace with a line for the student’s response.
- General directions that allow the student to construct a response may read as follows: “Show or explain your work using words, numbers, and/or diagrams.”
- Short Answer or Extended-Response items may require students to organize information, explain choices, support claims, or verify arguments, conclusions, solutions, and thinking.
- Any Short-Answer or Extended-Response item that requires the student to use information from a stimulus will specifically ask for the information; e.g., “Use numbers from the table to ...” or “Support your answer with information from the chart.”

Short-Answer Items

- Short-Answer items may ask for a figure, diagram, equation, and/or a few sentences.
- Short Answer items will involve a limited number of steps to develop a viable solution, demonstrate an understanding or process, communicate a mathematical idea or result, or show reasoning.
- Short-Answer items include Enhanced Multiple-Choice items that ask students to select from a list of four possible responses and then justify or explain the reason(s) for choosing that response.

Extended-Response Items

- Extended-Response items will require multiple steps.
- Extended-Response items may ask for a graph, figure, diagram, and/or table with labels or with words, sentences, or equations to support the graph, figure, diagram, or table.
- Extended-Response items will require a longer and more detailed response than Short-Answer items.
- Extended-Response items will require a more complex process than Short-Answer items to develop a viable solution, demonstrate an understanding or process, communicate mathematical ideas or results, or show reasoning.

6. Rules for Developing Scoring Rubrics

- All open-ended items on tenth-grade tests are written to address a single content or process strand.
- An item-specific scoring rubric will be developed for each Short-Answer and Extended-Response item during the writing of the item.
- Information from the pilot tests will be used to refine the scoring rubrics for use with the operational tests.
- Scoring rubrics will follow a “focused holistic” model in which the score for the response is based on overall quality in relation to the strand
- Individual score point elements will be based on the requirements of the item and its target.
- Students may not receive credit in estimation items by computing and then rounding.
- Scoring rubrics for measurement or communication items will require students to label units when the labels are not provided in the answer space.
- Short-Answer items will be scored with a 3-level scoring rubric (0-2).
- Extended-Response items will be scored with a 5-level scoring rubric (0-4).
- Individual scoring criteria will be developed for each constructed-response item based on the “Generic Scoring Rubrics” beginning on the next page.

7. Generic Scoring Rubrics

Individual scoring criteria will be developed for each constructed-response item. The following scoring rubrics are generalized for content or process strands.

Scoring rubric for Short-Answer items that assess concepts and procedures (content strands):

2-point response: The student shows understanding of the concept or procedure, appropriate use of applicable information and procedures, and accurate results.

1-point response: The student shows partial understanding of the concept or procedure with errors in the use of applicable information, procedures, or computations that limit the viability of an answer.

0-point response: The student shows very little or no understanding of the concept or procedure.

Scoring rubric for Short-Answer items that assess solves problems (SR01):

2-point response: The student defines a problem by identifying questions to be answered, missing or extraneous information, and/or what is known or unknown in a given situation.

1-point response: The student partially defines a problem by identifying some questions to be answered, some missing or extraneous information, or some of what is known or unknown in a given situation.

0-point response: The student shows very little or no understanding of how to define a problem.

Scoring rubric for Short-Answer items that assess solves problems (SR02):

2-point response: The student solves a problem by doing the following:

- shows understanding by organizing and using relevant information;
- uses appropriate strategies and/or procedures to construct a solution;
- provides an answer that is a viable solution, mathematically correct, and answers the question(s) asked.

1-point response: The student does one of the following:

- shows partial understanding of the problem and incomplete strategies or procedures;
- uses appropriate strategies and/or procedures with missing or incorrect answer;
- provides a correct answer with missing or incorrect work.

0-point response: The student shows very little or no understanding of how to solve a problem.

Scoring rubric for Extended-Response items that assess solves problems (SR02):

4-point response: The student solves a problem by doing the following:

- shows understanding by organizing and using relevant information;
- uses appropriate strategies and/or procedures to construct a solution;
- provides an answer that is a viable solution, mathematically correct, and answers the question(s) asked.

3-point response: The student shows understanding of the problem, uses appropriate strategies and/or procedures, provides an answer that follows from the student work. Calculation errors or gaps limit the viability or completeness of the solution.

2-point response: The student shows some understanding of the problem and limited use of appropriate strategies and/or procedures. The answer is a partial solution to the problem situation, is incorrect, or does not answer the question(s) asked.

1-point response: The student does one of the following:

- shows partial understanding of the problem,
- uses appropriate strategies and/or procedures with missing or incorrect answer,
- provides a correct answer with missing or incorrect work.

0-point response: The student shows very little or no understanding of how to solve a problem.

Scoring rubric for Short-Answer items that assess mathematical reasoning (SR03, SR04):

2-point response: The student shows effective reasoning by making an appropriate interpretation or comparison, by forming and fully supporting conclusions using evidence, and/or by evaluating procedures and results.

1-point response: The student shows limited reasoning by making a partial interpretation or comparison, forming and supporting conclusions with some evidence, and/or verifying results using some evidence.

0-point response: The student shows very little or no evidence of reasoning through interpretation, comparison, reaching conclusions, supporting, or evaluating.

Scoring rubric for Extended-Response items that assess mathematical reasoning (SR03, SR04):

- 4-point response: The student shows effective reasoning by making an appropriate interpretation or comparison, forming and fully supporting conclusions using evidence, and/or evaluating procedures and results.
- 3-point response: The student shows moderately effective reasoning by making a partial interpretation or comparison, forming and supporting conclusions with some evidence, and/or verifying results using evidence.
- 2-point response: The student shows limited reasoning by analyzing some information and/or forming and supporting conclusions or verifying results through limited use of evidence.
- 1-point response: The student shows faulty reasoning by incorrectly analyzing information and/or forming and supporting conclusions, or verifying results through inappropriate use of evidence or attention to inappropriate evidence.
- 0-point response: The student shows very little or no evidence of reasoning, analysis, interpretation, comparison, reaching conclusions, or verifying and supporting.

Scoring rubric for Short-Answer items that assess solves problems and reasons logically (SR05):

- 2-point response: The student shows understanding of the problem, uses appropriate strategies and/or procedures, provides an answer that is a viable solution, **AND** justifies results, explains why the solution is appropriate, makes a comparison, checks for reasonableness of results, and/or validates thinking.
- 1-point response: The student does one of the following:
- shows partial understanding of the problem, incomplete strategies or procedures, an incomplete answer, **AND** a flawed or incomplete justification or validation.
 - justifies or checks for reasonableness of results or validates thinking for a solution that is incomplete.
 - shows a correct answer with missing or incorrect work.
- 0-point response: The student shows very little or no understanding of how to solve a problem and very little or no justification or validation.

Scoring rubric for Extended-Response items that assess solves problems and reasons logically (SR05):

- 4-point response: The student solves a problem and shows effective reasoning by doing the following:
- shows understanding of the problem by selecting and organizing relevant information;
 - uses appropriate strategies and/or procedures to construct a solution;
 - provides an answer that is a viable solution to the problem, mathematically correct, and answers the question(s) asked;
 - completely justifies results, checks for reasonableness of results, and/or validates thinking and ideas.
- Note: If a calculation error does not detract from the viability of the solution, the response may still earn 4 points.
- 3-point response: The student shows understanding of how to solve a problem and reason logically by doing the following: organizes and uses relevant information; uses strategies and/or procedures appropriately; provides an answer that is a viable solution to the problem, mathematically correct, and answers the question(s) asked; and justifies results, checks for reasonableness of results, and/or validates thinking and ideas.
Calculation errors or gaps limit the viability or completeness of the solution.
- 2-point response: The student shows some understanding of problem solving and limited reasoning by doing the following: shows some use of appropriate strategies and procedures with an answer that is a partial solution to the problem situation, a result of multiple errors, or incorrect **AND** shows limited reasoning when justifying results, checking for reasonableness of results, or validating thinking.
- 1-point response: The student does one of the following:
- shows little understanding of the problem, little use of appropriate strategies, concepts, and/or procedures with an incorrect or missing answer **AND** shows a flawed or incomplete justification or validation.
 - shows a correct answer with missing or incorrect work.
- 0-point response: The student shows very little or no understanding of how to solve a problem **AND** very little or no justification or validation.

Scoring rubric for Short-Answer items that assess communicates understanding:

- 2-point response: The student shows understanding of how to gather, organize, and/or represent and share relevant mathematical information for a given audience and purpose.
- 1-point response: The student shows some understanding of how to gather, organize, and/or represent and share relevant mathematical information for a given audience and purpose; the response is not complete or is ineffectively presented.
- 0-point response: The student shows very little or no understanding of how to gather, organize and/or represent and share relevant mathematical information for a given audience and purpose.

Scoring rubric for Extended-Response items that assess communicates understanding:

- 4-point response: The student gathers all of the applicable information from appropriate sources, organizes mathematical ideas and information in a clear and systematic manner, and/or effectively, completely, and accurately represents and shares mathematical information and ideas for a given audience and purpose.
- 3-point response: The student gathers most of the applicable information from appropriate sources, organizes mathematical ideas and information in a clear manner, and/or represents and shares mostly complete and accurate mathematical information and ideas for a given audience and purpose.
- 2-point response: The student gathers some information from appropriate sources, partially organizes ideas and information, and/or represents and shares mathematical information and ideas for a given audience and purpose with several errors and/or gaps.
- 1-point response: The student gathers little information from appropriate sources or related information from any source, demonstrates understandings in a manner that may be disorganized or difficult to understand, and/or represents and shares mathematical information and ideas with major errors and gaps and may or may not address the given audience or purpose.
- 0-point response: The student shows very little or no understanding of how to gather, organize and/or represent and share mathematical information.

Scoring rubric for Short-Answer items that assess makes connections:

- 2-point response: The student makes a mathematical connection, appropriately and accurately using concepts and/or procedures from two or more of the content strands or identifies, describes, and/or creates different mathematical representations that are equivalent.
- 1-point response: The student shows partially correct use of concepts or procedures from two or more of the content strands or identifies some likenesses or partially describes or creates different mathematical representations.
- 0-point response: The student shows very little or no use of concepts or procedures from the content strands or does not identify, describe, or create equivalent mathematical representations.

In summary, mathematics items will assess whether students understand mathematical concepts and apply procedures, whether they can approach problems and develop viable solutions, whether they can reason effectively, and/or whether they can communicate their understanding effectively in mathematical terms.

OVERVIEW OF ITEM SPECIFICATIONS

For each learning target, item specifications are organized under five headings or sections:

- Learning Target
- Item Format(s)
- Stimulus, Stem, and Prompt Rules
- Mathematical Vocabulary and Terms
- Item Characteristics

The Learning Target includes one or more of the eighth and tenth grade benchmark indicators which are identified by the numbers that follow the target. The first digit in each number corresponds to the Essential Academic Learning Requirement; the second digit corresponds to the component; and the third digit corresponds to the specific assessment benchmark indicator. The assessment indicator statement defines the component and was developed in parallel with grade level expectations. All WASL test items are based on assessment indicators.

NOTE: The use of italics within a learning target denotes an indicator from the previous grade.

The Item Format identifies which formats the test items may utilize: Multiple-Choice, Short-Answer, and/or Extended-Response.

The Stimulus, Stem, and Prompt Rules section lists attributes of the stimulus that might accompany a question, such as brief written materials and/or diagrams, graphs, tables, charts, or drawings. Guidelines for the stem and prompt may be included. This section may also note any tools or manipulatives needed to answer the question.

The Mathematical Vocabulary and Terms section notes any mathematical vocabulary or terms that may be used in item stems and answer choices. Other mathematical terms that need explanation or contextual support for students or are not to be used are also identified. All mathematics vocabulary and terms allowed on the item specifications for all previous grade levels may also be used on tenth-grade assessments.

The Item Characteristics section highlights important points about the conceptual knowledge, procedural skill, or mathematical process being assessed.

Although wording throughout the learning targets may seem to indicate that all items will assess students' understandings of several concepts or procedures, the ands in the targets should be understood to mean and/or, since some items, particularly Multiple-Choice items, may focus on only one concept or procedure. However, items will be developed for every concept, procedure, and process.

CONTENT STRANDS AND LEARNING TARGETS

Content Strand 1: Number Sense

NS01 (Number and Numeration) Demonstrate understanding of the concepts and symbolic representations of *rational numbers including whole number powers, square roots of perfect squares*, and numbers written in scientific notation; *demonstrate understanding of the relative values of rational numbers including whole number powers and square roots of perfect squares; demonstrate understanding of and use the distributive property and properties of addition and multiplication with rational numbers including integers* (1.1.1, 1.1.2, 1.1.3)

Item Format(s):

- Multiple-Choice and Short-Answer items may be used to test this learning target.

Stimulus, Stem, and Prompt Rules:

- Stimulus may include pictures, tables, charts, diagrams, figures, number lines, pictorial models, and illustrations.
- Powers may be positive whole numbers that result in squares less than or equal to 15^2 or cubes less than or equal to 5^3 .
- Square roots may be of perfect squares less than or equal to 225.
- Fractions may include the following denominators: 2, 3, 4, 5, 6, 8, 9, 10, 12, 15, 16, 20, 25, 50, 100.

Mathematical Vocabulary and Terms:

- Terms that may be used: *cube root, equivalent, evaluate, exponent, power, property, scientific notation, square root, standard notation*
- Terms that may be used with definitions or examples: *compare* (tell how they are alike and/or different), *rational number*
- Terms that may not be used: *associative, commutative, distributive, identity, integer, inverse, real number, reduce, zero property*

Item Characteristics:

- Items may ask students to identify, show, or explain the meaning of a rational number including squares, cubes, square roots, or scientific notation.
- Items may ask students to identify and use scientific notation in a given situation.
- Items may ask students to identify a situation that corresponds to a number written in scientific notation.
- Items may ask students to explain and/or illustrate the meaning of square, cube, and/or square root.
- Items may ask students to identify, express, and/or use equivalents among common fractions, decimals, percents, powers, roots, and numbers written in scientific notation.
- Items may ask students to compare and order rational numbers, including fractions, decimals, percents, integers, positive integer exponents, square roots, and/or numbers written in scientific notation.
- Items may ask students to identify, use, illustrate, or evaluate an application of the following properties with rational numbers:

Properties of Addition	Inverse Property	Commutative Property	Associative Property	Identity Property		Distributive Property
Properties of Multiplication	Inverse Property	Commutative Property	Associative Property	Identity Property	Zero Property	

Content Strand 1: Number Sense

NS02 (Ratio and Proportion) Demonstrate understanding of and apply the concepts of *ratio*, *percent*, and both direct and inverse proportion (1.1.4)

Item Format(s):

- Multiple-Choice and Short-Answer items may be used to test this learning target.

Stimulus, Stem, and Prompt Rules:

- Stimulus may include numbers, tables, charts, and diagrams.
- Stimulus may include integers, fractions, decimals, exponents, and/or square roots.
- Both numbers and variables may be used in items assessing this target.

Mathematical Vocabulary and Terms:

- Terms that may be used: *percent*, *proportion*, *proportional*, *ratio*, *scale*, *similar*
- Terms that may be used with definitions or examples: *rational number*
- Terms that may not be used:

Item Characteristics:

- a) Items may ask students to identify or determine a percent, ratio, or proportion in a given situation.
- b) Items may ask students to explain or illustrate the meaning of a percent, ratio, or proportion.
- c) Items may ask students to use percent, ratio, and/or either direct or indirect proportion to determine a number of events, objects, measurements, or numbers.
- d) Items may ask students to identify or determine a term or ratio to complete a proportion.
- e) Items may ask students to identify or represent equivalent ratios and/or percents using pictures, diagrams, or symbols.

Content Strand 1: Number Sense

NS03 (Conceptual Understanding of Operations) *Demonstrate understanding of the meaning of operations with rational numbers including whole number powers and square roots (1.1.5)*

Item Format(s):

- Multiple-Choice and Short-Answer items may be used to test this learning target.

Stimulus, Stem, and Prompt Rules:

- Stimulus may include words, numbers, mathematical expressions, illustrations, charts, graphs, or diagrams.
- Fractions may include denominators of 2, 4, 8 or 2, 3, 6, 12 or 2, 5, 10.
- Powers may be whole numbers that result in squares less than or equal to 15^2 or cubes less than or equal to 5^3 .
- Square roots may be of perfect squares less than or equal to 225.

Mathematical Vocabulary and Terms:

- Terms that may be used: *cube, equation, exponent, power, square, square root*
- Terms that may be used with definitions or examples: *divisor, quotient*
- Terms that may not be used: *addend, dividend, minuend, multiplicand, subtrahend*

Item Characteristics:

- a) Items may ask students to draw a picture(s) or give an explanation to show understanding of operations with rational numbers including squares, cubes and square roots.
- b) Items may ask students to explain or give an example showing why the order of operations, including exponents, is important.
- c) Items may ask students to select and/or use an appropriate operation to show understanding of operations with rational numbers including squares, cubes and square roots.
- d) Items may ask students to translate a given picture or illustration into an equivalent symbolic representation of operations with rational numbers including whole number powers and square roots.

Content Strand 1: Number Sense

NS04 (Computation) Complete multi-step computations with combinations of rational numbers including *integers*, whole number powers, and square roots of perfect squares, *using order of operations* (1.1.6)

Item Format(s):

- Multiple-Choice and Short-Answer items may be used to test this learning target.

Stimulus, Stem, and Prompt Rules:

- Stimulus may be in the form of words, numbers, mathematical expressions, illustrations, charts/graphs, or diagrams.
- Fractions that may be used include the following denominators: 2, 3, 4, 5, 6, 7, 8, 9, 10, 12, 15, 16, 20, 24, and 100.
- Powers may be whole numbers that result in squares less than or equal to 15^2 or cubes less than or equal to 5^3 .
- Square roots may be of perfect squares less than or equal to 225.
- Items may ask for answers in simplest form.
- Working with integers, fractions, decimals, square roots, and exponents may be required within the same item.
- NS04 items will be on a “no tools” day.
- Items assessing computation with rational numbers will use the following guidelines:

Numbers	Session Without Tools
Integers	to the thousands place
Decimals	to the thousandths place, division to hundredths place
Fractions	four fractions with denominators 2, 3, 4, 5, 6, 7, 8, 9, 10, 12, 15, 16, 18, 20, 24, 25, 36, 50, 100
Powers	through 15^2 or 5^3
Square roots	perfect squares through 225

Mathematical Vocabulary and Terms:

- Terms that may be used: *addition, difference, division, multiplication, operation, order of operations, power, product, remainder, simplify, square root, subtraction, sum*
- Terms that may be used with definitions or examples include: *quotient, reciprocal*
- Terms that may not be used: *addend, dividend, divisor, integer, minuend, reduce, subtrahend*

Item Characteristics:

- a) Items may ask students to compute using whole number powers, cubes, square roots of perfect squares, and numbers written in scientific notation.
- b) Items may ask students to do multiple step calculations requiring two or more different operations.
- c) Items may ask students to compute using order of operations, including exponents.
- d) Items may ask students to interpret the concept of remainder in a given context and use appropriately.

Content Strand 1: Number Sense

NS05 (Estimation) *Identify when an approximation is appropriate; use estimation to determine the reasonableness of answers in situations involving multi-step computations with rational numbers including integers, whole number powers, and square roots (1.1.8)*

Item Format(s):

- Multiple-Choice and Short-Answer items may be used to test this learning target.
- Multiple-Choice items will not ask students to estimate and identify the answer except for square roots.

Stimulus, Stem, and Prompt Rules:

- Stimulus may include tables, charts, diagrams, and illustrations.
- Items will not require the use of a particular estimation strategy.
- Items may present situations involving multi-step computations with rational numbers including integers, squares less than or equal to 15^2 , cubes less than or equal to 15^3 , and/or square roots of numbers less than or equal to 225.
- NS05 items will be on a “no tools” day.

Mathematical Vocabulary and Terms:

- Terms that may be used: *approximate* (as an adjective, not a verb), *approximately*, *approximation*, *estimate*, *estimation*, *evaluate*, *reasonable*
- Terms that may be used with definitions or examples: *quotient*
- Terms that may not be used: *clustering*, *compatible numbers*, *front end estimation* or names of other estimation strategies, *integer*

Item Characteristics:

- a) Items may ask students to evaluate the appropriateness of estimation versus exact calculation in situations involving multi-step computations with rational numbers.
- b) Items may ask students to estimate computation results in situation involving rational numbers including squares, cubes, and square roots.
- c) Items may ask students to use estimation to determine whether a computation result is reasonable in a given situation.
- d) Items may ask students to describe a strategy used for estimation involving multi-step computations with rational numbers including integers, whole number powers, and square roots of numbers up to 225.

Note: Students may not receive credit in estimation items for computing and then rounding.

Content Strand 2: Measurement

ME01 (Attributes and Dimensions) Demonstrate understanding of how a change in one linear dimension affects surface area and volume or how changes in two linear dimensions affect perimeter, area, and volume (1.2.1)

Item Format(s):

- Multiple-Choice and Short-Answer items may be used to test this learning target.

Stimulus, Stem, and Prompt Rules:

- Stimulus may include pictures, tables, charts, diagrams, figures, and illustrations.
- Stimulus will include illustrations in items that involve finding area or volume.
- Formulas may be given in the problem.
- Items will not require students to convert from U.S. to metric or metric to U.S.
- The answer and distractors will be stated in terms of the same system of measurement.

Mathematical Vocabulary and Terms:

- Terms that may be used: *area, centimeter, circumference, cone, cubic units, cylinder, feet, height, inch, kilometer, meter, mile, millimeter, perimeter, prism, pyramid, radius/radii, square unit, surface area, volume, yard*
- Terms that may be used with definitions or examples: *compare* (tell how they are alike and/or different)
- Terms that may not be used:
- Students are expected to know how to determine the following:

<i>Perimeter of a polygon</i>
<i>Sum of interior angle of a polygon</i>
<i>Area of a rectangle</i>
<i>Area of a triangle</i>
<i>Volume of a rectangular prism</i>
<i>Length using the Pythagorean Theorem</i>

Item Characteristics:

- Items may ask students to identify, describe, and/or compare the impact on perimeter, area, surface area, or volume caused by a change in one linear dimension.
- Items may ask students to identify, describe, or compare the impact on perimeter, area, surface area, or volume caused by a change in two linear dimensions.
- Items may ask students to determine a change in one dimension of a figure based on a given change in perimeter, area, or volume.
- Items may ask students to determine changes in two dimensions of a figure based on a given change in perimeter, area, or volume.
- Items may ask students to compare the impact on perimeter, area, surface area, and/or volume of 2 figures caused by a given change in one or two dimensions of each.

Note: Students are expected to determine and label units.

Content Strand 2: Measurement

ME02 (Units and Systems) *Demonstrate understanding of rate and other derived units of measurement; demonstrate understanding of how to convert within the US or metric system to achieve an appropriate level of precision; explain why different situations require different levels of precision (1.2.2, 1.2.3)*

Item Format(s):

- Multiple-Choice and Short-Answer items may be used to test this learning target.

Stimulus, Stem, and Prompt Rules:

- Stimulus may include pictures, figures, tables, charts, diagrams, and written descriptions.
- Rates may be expressed using either the slash or the horizontal bar.
- Formulas may be given in an item.
- Conversion facts may be given in an item, e.g., 1 mile = 5,280 feet.
- Items will not require students to convert from U.S. to metric or metric to U.S.
- The answer and distractors will be stated in terms of the same system of measurement.

Mathematical Vocabulary and Terms:

- Terms that may be used: *area, Celsius, centimeter, cubic unit, degree, Fahrenheit, foot/feet, gram, inch, kilogram, kiloliter, kilometer, liter, meter, mile, milligram, milliliter, millimeter, ounce, pound, precision, rate, slope, square unit, surface area, volume, yard*
- Terms that may be used with definitions or examples:
- Terms that may not be used:

Item Characteristics:

- a) Items may ask students to calculate rate or other derived measurements and determine and label units.
- b) Items may ask students to explain the concept of rate in a particular situation.
- c) Items may ask students to use rates to determine a measured outcome, e.g., $\text{rate} \times \text{time} = \text{distance}$ or $\text{miles/hour} \times \text{hours} = \text{miles}$.
- d) Items may ask students to explain how division of measurements produces a derived unit of measure, e.g., gallons/hour or km/L.
- e) Items may ask students to show or describe the meaning of slope as a rate of change in a given situation.
- f) Items may ask students to identify, determine, and/or use slope as a rate of change in a given situation.
- g) Items may ask students to convert a unit of measurement within a system to achieve an appropriate level of precision in a given situation.
- h) Items may ask students to explain why different situations require different levels of precision.

Note: Students are expected to determine and label units.

Content Strand 2: Measurement

ME03 (Procedures) Use formulas, including the *Pythagorean Theorem*, to determine measurements of *triangles*, prisms, or cylinders (1.2.5)

Item Format(s):

- Multiple-Choice and Short-Answer items may be used to test this learning target.

Stimulus, Stem, and Prompt Rules:

- Stimulus may include pictorial representations of objects and figures, tables, charts, and graphs.
- Items will not require students to convert from U.S. to metric or metric to U.S.
- Conversion facts may be given in an item, e.g., 1 mile = 5,280 feet.
- The answer and distractors will be stated in terms of the same system of measurement.

Mathematical Vocabulary and Terms:

- Terms that may be used: *area, centimeter, cubic unit, foot/feet, inch, kilometer, meter, mile, millimeter, perimeter, Pythagorean Theorem, square unit, surface area, volume, yard*
- Terms that may be used with definitions or examples: *compare* (tell how they are alike and/or different)
- Terms that may not be used:
- Students are expected to know how to determine the following:

<i>Perimeter of a polygon</i>
<i>Sum of interior angle of a polygon</i>
<i>Area of a rectangle</i>
<i>Area of a triangle</i>
<i>Volume of a rectangular prism</i>
<i>Length using the Pythagorean Theorem</i>

Item Characteristics:

- Items may ask students to find linear or area measurements of a triangle.
- Items may ask students to determine linear dimensions of a triangle, prism or cylinder based on a given perimeter, circumference, area, and/or volume.
- Items may ask students to determine volume and/or surface area of a prism or cylinder.
- Items may ask students to use the *Pythagorean Theorem* to determine a missing measurement of a triangle, prism, or cylinder.

Note: Students are expected to determine and label units.

Content Strand 2: Measurement

ME04 (Estimated Measurements) Identify situations in which estimated measurements are sufficient; use estimation to obtain reasonable measurements at an appropriate level of precision (1.2.6)

Item Format(s):

- Multiple-Choice and Short-Answer items may be used to test this learning target.
- Multiple-Choice items will not ask students to estimate and identify the answer.

Stimulus, Stem, and Prompt Rules:

- Stimulus may include pictures, tables, charts, diagrams, figures, and illustrations.
- Items should focus on the appropriate use of estimation rather than particular estimation strategies.
- The answer and distractors will be stated in terms of the same system of measurement.
- ME04 items will be on a “no tools” day.

Mathematical Vocabulary and Terms:

- Terms that may be used: *approximate, approximation, centimeter, cubic units, cup, estimate, estimation, foot/feet, gallon, gram, inch, kilogram, kiloliter, kilometer, liter, meter, mile, milligram, milliliter, millimeter, ounce, pint, pound, quart, square units, surface area, volume, yard*
- Terms that may be used with definitions or examples:
- Terms that may not be used:
- Students are expected to know how to determine the following:

<i>Perimeter of a polygon</i>
<i>Sum of interior angle of a polygon</i>
<i>Area of a rectangle</i>
<i>Area of a triangle</i>
<i>Volume of a rectangular prism</i>
<i>Length using the Pythagorean Theorem</i>

Item Characteristics:

- Items may ask students to determine when or whether estimation is appropriate for finding approximations of a measurement.
- Items may ask students to identify a process that would be an appropriate way to estimate a measurement.
- Items may ask students to explain why they would use estimation rather than a precise measurement.
- Items may ask students to estimate perimeter, area, volume, and/or surface area and/or explain why the estimate has an appropriate level of precision.
- Items may ask students to estimate conversions between systems, U.S. to metric or metric to U.S., using meters and yards or quarts and liters.

Note: Students will not receive credit in estimation items by computing and then rounding.

Note: Students are expected to determine and label units.

Content Strand 3: Geometric Sense

GS01 (Properties and Relationships) Demonstrate understanding of the characteristics of *cylinders, cones, and pyramids* and the relationships among 1-dimensional, 2-dimensional, and 3-dimensional figures; draw, describe, and/or compare 1-dimensional, 2-dimensional, and 3-dimensional shapes and figures, including prisms, cylinders, cones, and pyramids; *use the Pythagorean Theorem to determine if a triangle is a right triangle* (1.3.1, 1.3.2)

Item Format(s):

- Multiple-Choice and Short-Answer items may be used to test this learning target.

Stimulus, Stem, and Prompt Rules:

- Stimulus may include illustrations of 2-dimensional figures, 3-dimensional figures, and real-world objects.
- Stimulus will include a box drawn in figures for right angles, hash marks on line segments to indicate congruent sides, and the symbol \perp to indicate perpendicular lines.

Mathematical Vocabulary and Terms:

- Terms that may be used: *2-dimensional figure, 3-dimensional figure, acute, angle, arc, base, circle, circumference, cone, cube, cylinder, diagonal, diameter, dimensions, edge, equilateral, face, figure, hexagon, hypotenuse, intersect, isosceles, line, line segment, midpoint, obtuse, octagon, parallel, parallelogram, pentagon, perpendicular, Pythagorean Theorem, plane, point, polygon, prism, pyramid, quadrilateral, radius/radii, rectangle, rhombus, right angle, right triangle, side, slant height, square, trapezoid, triangle, figure, vertex/vertices*
- Terms that may be used with definitions or examples: *compare* (tell how they are alike and/or different), *interior angle, net, regular, tessellation, vertical angle*
- Terms that may not be used: *exterior angle, plane figure, skew, solid figure*
- Students are expected to know the following:

*Adjacent angles on a straight line have a sum of 180° .
The sum of the angles of a triangle is 180° .
The angles opposite congruent sides of an isosceles triangle are congruent.
The Pythagorean Theorem.
Triangle inequality.*

Item Characteristics:

- Items may ask students to identify and/or describe prisms, cylinders, cones and/or pyramids using geometric properties.
- Items may ask students to compare, sort, and/or label prisms, cylinders, cones and/or pyramids using geometric properties and relationships.
- Items may ask students to translate between 3-dimensional objects and various views of their 2-dimensional representations.
- Items may ask students to identify a 3-dimensional figure that could be formed by folding a given net.
- Items may ask students to identify or draw a net for a prism, cylinder, cone, or pyramid.
- Items may ask students to determine if a triangle is a right triangle by using the Pythagorean Theorem.
- Items may ask students to use properties of triangles and special triangles to answer a question.

Content Strand 3: Geometric Sense

GS02 (Locations and Transformations) Use geometric properties to describe or identify the location of points on coordinate grids; use multiple transformations including translations, reflections, and/or rotations to create congruent figures (1.3.3, 1.3.4)

Item Format(s):

- Multiple-Choice and Short-Answer items may be used to test this learning target.

Stimulus, Stem, and Prompt Rules:

- All four quadrants of the Cartesian plane may be used.
- Grids will be provided in items that require students to plot a particular figure or to construct a transformation.
- Grids may use ordered number pairs or letter and number combinations.
- Grids will have the origin and scales labeled.
- Ordered pairs may use rational numbers.
- Before and after transformations, figures may have orientations other than vertical and horizontal.

Mathematical Vocabulary and Terms:

- Terms that may be used: *angle, axis/axes, clockwise, coordinate, counterclockwise, degree, grid, horizontal, intersect, ordered pair, origin, parallel, perpendicular, plot, point, quadrant, reflection, rotation, transformation, translation, vertex/vertices, vertical, vertical angles, x-axis, y-axis*
- Terms that may be used with definitions or examples:
- Terms that may not be used: *3-dimensional coordinate grid, abscissa, Cartesian plane, domain or range of a linear function, ordinate, rectangular grid*

Item Characteristics:

- a) Items may ask students to plot points or objects on a coordinate grid using ordered pairs and/or labels.
- b) Items may ask students to identify or write ordered pairs describing the locations of points or objects on a coordinate grid.
- c) Items may ask students to identify or write ordered pairs and/or labels describing the location of transformed objects on a 2-dimensional coordinate grid.
- d) Items may ask students to identify or describe the combination of two translations, reflections, and/or rotations to transform one figure to another figure with or without a coordinate grid.
- e) Items may ask students to plot and draw a particular combination of transformation(s) of a figure on a grid.
- f) Items may ask students to identify a picture or diagram of a particular combination of transformations of a figure, with or without a grid.

Content Strand 4: Probability and Statistics

PS01 (Probability) Demonstrate understanding of the concepts of compound, dependent and independent events; determine and use probabilities of compound, dependent, and independent events (1.4.1, 1.4.2)

Item Format(s):

- Multiple-Choice and Short-Answer items may be used to test this learning target.

Stimulus, Stem, and Prompt Rules:

- Stimulus may include pictures of objects such as game spinners, coins, chips, marbles, number cubes, diagrams, tables, charts, graphs, and tree diagrams.
- A probability may be expressed as a percent, ratio, or decimal.

Mathematical Vocabulary and Terms:

- Terms that may be used: *compound, dependent, event, independent, outcome, probability, sample space, theoretical probability, tree diagram*
- Terms that may be used with definitions or examples: *combination*
- Terms that may not be used: *conditional, counting principle, factorial (!), permutation*

Item Characteristics:

- a) Items may ask students to identify, describe, or illustrate an example of dependent or independent events.
- b) Items may ask students to identify or determine the probability of dependent or independent events.
- c) Items may ask students to identify, determine the size of, or list the sample space of experiments involving dependent or independent events.
- d) Items may ask students to identify a compound event with a given probability.
- e) Items may ask students to identify or determine the probability of a compound event.
- f) Items may ask students to determine or explain when events are compound.
- g) Items may ask students to create a simple game, event, or situation that would produce a given probability or would be a fair game.
- h) Items may ask students to explain the relationship of theoretical probability and empirical frequency using simulations.

Content Strand 4: Probability and Statistics

PS02 (Data Collection and Central Tendencies) Identify possible sources of bias in questions, data collection methods, samples, and/or measures of central tendency in a situation and describe how such bias can be controlled; *identify clusters and outliers and determine how they may affect measures of central tendency* (1.4.3, 1.4.4)

Item Format(s):

- Multiple-Choice and Short-Answer items may be used to test this learning target.

Stimulus, Stem, and Prompt Rules:

- Stimulus may include descriptive scenarios that involve survey questions, collection methods, and obtaining a sample from a population.
- Stimulus may include tables, charts, diagrams, pictures, bar graphs, line plots, pictographs, circle graphs, histograms, line graphs, scatter plots, stem-and-leaf plots, and box-and-whisker plots.

Mathematical Vocabulary and Terms:

- Terms that may be used: *bias, cluster, data, mean, median, mode, outlier, population, questionnaire, range, sample, survey, variable*
- Terms that may be used with definitions or examples:
- Terms that may not be used: *measures of central tendency, reliability*

Item Characteristics:

- a) Items may ask students to identify or write survey questions that will obtain the appropriate information and will avoid bias.
- b) Items may ask students to identify or describe an appropriate population or a procedure for selecting an unbiased sample.
- c) Items may ask students to identify sources of bias or inaccuracy in data collection questions, samples, and/or methods and describe how such bias can be controlled.
- d) Items may ask students to summarize data, to identify, determine, and/or use measures of central tendency and range to describe a set of data.
- e) Items may ask students to identify clusters and/or outliers and/or determine how they may affect measures of central tendency.
- f) Items may ask students to determine which measure of central tendency is the best descriptor of a given set of data.

Content Strand 4: Probability and Statistics

PS03 (Data Representation and Interpretation) Draw a reasonable line to describe the data represented by a scatter plot and determine whether a straight line is an appropriate way to describe the trend in the data; *read and interpret data presented in tables of ordered pairs and scatter plots and make predictions based on the given data*; use statistics to support different points of view or evaluate a statistical argument based on data (1.4.5, 1.4.6)

Item Format(s):

- Multiple-Choice and Short-Answer items may be used to test this learning target.

Stimulus, Stem, and Prompt Rules:

- Stimulus may include tables, charts, diagrams, pictures, line graphs, or scatter plots.

Mathematical Vocabulary and Terms:

- Terms that may be used: *axis/axes, evaluate, intercept, line graph, origin, scale, scatter plot, trend*
- Terms that may be used with definitions or examples:
- Terms that may not be used: *continuous, discrete, infer*

Item Characteristics:

- a) Items may ask students to draw a reasonable line to describe the data represented by a scatter plot.
- b) Items may ask students to determine whether a straight line is an appropriate way to describe the trend in a set of data.
- c) Items may ask students to identify an equation of a line that fits data displayed on a scatter plot.
- d) Items may ask students to read and interpret data presented in tables of ordered pairs and scatter plots and make an inference or prediction based on the given data.
- e) Items may ask students to describe the accuracy and completeness of the data in a table, diagram, and/or graph.
- f) Items may ask students to determine whether a prediction and/or conclusion is reasonable based on the given data or graph.
- g) Items may ask students to identify or describe trends and patterns in data or graphs.
- h) Items may ask students to describe and/or evaluate how statistics have been used or misused to support points of view or arguments.
- i) Items may ask students to use data to support different points of view.

Content Strand 5: Algebraic Sense

AS01 (Patterns and Functions) Recognize, extend, or create a pattern or sequence of pairs of numbers representing a linear function; identify or write a rule to describe a pattern, sequence, and/or a linear function (1.5.1, 1.5.2)

Item Format(s):

- Multiple-Choice and Short-Answer items may be used to test this learning target.

Stimulus, Stem, and Prompt Rules:

- Stimulus may include tables, charts, diagrams, and pictorial representations of objects or geometric shapes.
- Number patterns may be presented in a sequence or in a table of number pairs.
- A given pattern must have a minimum of four elements or terms given.
- A number pattern may involve one or a combination of two operations to move from one term in the pattern to the next.
- Operations may include addition, subtraction, multiplication, division, or simple exponents.

Mathematical Vocabulary and Terms:

- Terms that may be used: *function, interval, pattern, predict, rule, sequence*
- Terms that may be used with definitions or examples:
- Terms that may not be used: *arithmetic sequence, geometric sequence, increment*

Item Characteristics:

- a) Items may ask students to create a linear pattern and/or explain what makes it a linear pattern.
- b) Items may ask students to extend a pattern by identifying or supplying missing elements in the beginning, middle and/or end and/or describe the pattern or write a rule.
- c) Items may ask students to identify a pattern that is equivalent to or different than a given pattern.
- d) Items may ask students to create a pattern that uses the same rule as a given pattern.
- e) Items may ask students to identify, describe, or represent linear patterns in tables, graphs, words, or algebraic symbols.
- f) Items may ask students to identify a rule representing a pattern, sequence, or linear function.
- g) Items may ask students to write a rule to describe a pattern, sequence, or linear function.
- h) Items may ask students to translate between/among numerical, graphical, and algebraic forms of linear functions.

Content Strand 5: Algebraic Sense

AS02 (Symbols and Notations) Represent relationships between quantities using squares, cubes, and square roots; use variables to write expressions, linear equations, and inequalities that represent situations involving *rational numbers*, whole number powers, and square and cube roots (1.5.3, 1.5.4)

Item Format(s):

- Multiple-Choice and Short-Answer items may be used to test this learning target.

Stimulus, Stem, and Prompt Rules:

- Stimulus may include pictorial representations, tables, charts, lists, and symbolic or written rules showing number patterns.
- Stimulus may include variable quantities in expressions, equations, or inequalities.
- Stimulus may include powers of square whole numbers less than or equal to 15^2 or cubes less than or equal to 5^3 .
- Stimulus may include square roots of whole numbers less than or equal to 225.
- Stimulus should avoid the use of the letters a, b, c, d, and x as variables.

Mathematical Vocabulary and Terms:

- Terms that may be used: *algebra, algebraic, cube, cube root, equation, expression, function, inequality, interval, power, relationship, square, square root, unknown, variable*
- Terms that may be used with definitions or examples:
- Terms that may not be used:

Item Characteristics:

- a) Items may ask students to identify or write expressions using variables to represent a situation.
- b) Items may ask students to identify or write an equation and/or inequality using variables to represent a situation.
- c) Items may ask students to explain the meaning of a variable in a formula, expression, or equation.
- d) Items may ask students to identify or describe a situation that corresponds to an algebraic representation.
- e) Items may ask students to represent quantities using squares, cubes, and square roots.
- f) Items may ask students to differentiate between and explain correct versus incorrect representations of algebraic situations.

Content Strand 5: Algebraic Sense

AS03 (Evaluating and Solving) Simplify expressions; solve multi-step equations, systems of equations, and one-step inequalities (1.5.5, 1.5.6)

Item Format(s):

- Multiple-Choice and Short-Answer items may be used to test this learning target.

Stimulus, Stem, and Prompt Rules:

- Stimulus may include pictorial representations, tables, charts, graphs, equations, or inequalities.
- Stimulus should avoid the use of letters a, b, c, d, or x as variables.
- Solving an inequality should not involve multiplying or dividing by a negative number.

Mathematical Vocabulary and Terms:

- Terms that may be used: *expression, formula, function, relationship, solve, unknown, value, variable*
- Terms that may be used with definitions or examples:
- Terms that may not be used: *quadratic, setup*

Item Characteristics:

- a) Items may ask students to simplify or write and simplify an expression, including applying the distributive property.
- b) Items may ask students to solve or write and solve an equation.
- c) Items may ask students to solve or write and solve an inequality.
- d) Items may ask students to solve or write and solve a system of equations.
- e) Items may ask students to evaluate an expression or formula that involves squares or cubes.

PROCESS STRANDS AND LEARNING TARGETS

Process Strand 6: Solves Problems and Reasons Logically

SR01 (Define Problems) Identify questions to be answered in complex situations; recognize when information is missing or extraneous; identify what is known and unknown in complex situations (2.1.1, 2.1.2, 2.1.3)

Item Format(s)

- Multiple-Choice and Short-Answer items may be used to test this learning target.

Stimulus, Stem, and Prompt Rules:

- Stimulus may include tables, charts, graphs, text, maps, diagrams, 2- and 3-dimensional figures, statistics, data, or other mathematical information.
- Problem situations may have multiple viable solutions.

Mathematical Vocabulary and Terms:

- All vocabulary and terms allowed and restricted in content strand specifications apply to Solves Problems and Reasons Logically items.
- Terms that may be used: *irrelevant, not important, not needed, relevant*
- Terms that may be used with definitions or examples:
- Terms that may not be used: *extraneous, process*

Item Characteristics:

- a) Items may ask students to identify requisite, missing and/or extraneous information that is important for understanding and solving a given problem situation.
- b) Items may ask students to identify or clarify the question the problem presents.
- c) Items may ask students to formulate or identify additional question(s) that need to be answered in order to find a solution to a given problem.
- d) Items may ask students to identify the “known” and “unknown” information in a given problem situation.

Process Strand 6: Solves Problems and Reasons Logically

SR02 (Construct Solutions) Select and organize relevant information; use appropriate concepts and procedures from number sense, measurement, geometric sense, probability and statistics, and algebraic sense; use a variety of strategies and approaches; determine whether a solution is viable, mathematically correct; and answers the question(s) asked (2.2.1, 2.2.2, 2.2.3, 2.2.4)

Item Formats

- Short-Answer and Extended-Response items may be used to test this learning target.

Stimulus, Stem, and Prompt Rules:

- Stimulus may include tables, charts, graphs, text, maps, diagrams, 2- and 3-dimensional figures, statistics, data, or other mathematical information.
- Problem situations may have multiple viable solutions.
- Problems may present real-world situations that could be encountered by tenth graders.

Mathematical Vocabulary and Terms:

- All vocabulary and terms allowed and restricted in content strand specifications apply to Solves Problems and Reasons Logically items.
- Terms that may be used: *solution, solve, strategy*
- Terms that may be used with definitions or examples:
- Terms that may not be used: *guess-check-revise, work backward* or the specific names of problem solving strategies

Item Characteristics:

- a) Items may ask students to solve a problem by doing the following:
 - show understanding of the problem by selecting and organizing relevant information;
 - use strategies and procedures appropriately to construct a solution;
 - ansWER the problem with a viable solution that is mathematically correct and answers the question(s) asked.
- b) Items may ask students to determine whether a given solution shows the use and organization of relevant information.
- c) Items may ask students to determine whether a given solution shows the use of strategies and procedures that are appropriate.
- d) Items may ask students to determine whether a given answer is a viable solution, mathematically correct, and/or answers the question(s) asked in a problem situation.

Process Strand 6: Solves Problems and Reasons Logically

SR03 (Analyze Information) Interpret, compare, and integrate mathematical information from multiple sources (3.1.1)

Item Format(s)

- Multiple-Choice, Short-Answer, and Extended-Response items may be used to test this learning target.

Stimulus, Stem, and Prompt Rules:

- Stimulus may include tables, charts, graphs, text, maps, diagrams, 2- and 3-dimensional figures, statistics, data, or other mathematical information.

Mathematical Vocabulary and Terms:

- All vocabulary and terms allowed and restricted in content strand specifications apply to Solves Problems and Reasons Logically items.
- Terms that may be used: *agree*
- Terms that may be used with definitions or examples: *analyze, compare* (tell how they are alike and/or different), *interpret*
- Terms that may not be used: *conflicting, contradictory, discrepancy*

Item Characteristics:

- a) Items may ask students to analyze or interpret mathematical information or results.
- b) Items may ask students to compare mathematical information in text, graphs, tables, diagrams, and/or pictorial representations.
- c) Items may ask students to compare information in order to answer a question.
- d) Items may ask students to compare patterns or trends shown by data or other information.
- e) Items may ask students to integrate information from two or more sources to develop an interpretation.

Process Strand 6: Solves Problems and Reasons Logically

SR04 (Conclude) Draw conclusions and support them using inductive and deductive reasoning; evaluate procedures and make needed revisions (3.2.1, 3.2.2)

Item Format(s)

- Multiple-Choice, Short-Answer, and Extended-Response items may be used to test this learning target.

Stimulus, Stem, and Prompt Rules:

- Stimulus may include tables, charts, graphs, text, maps, diagrams, 2- and 3-dimensional figures, statistics, data, or other mathematical information.

Mathematical Vocabulary and Terms:

- All vocabulary and terms allowed and restricted in content strand specifications apply to Solves Problems and Reasons Logically items.
- Terms that may be used: *conclude, conclusion, evaluate, justify, prove, support, verify*
- Terms that may be used with definitions or examples: *analyze*
- Terms that may not be used: *inference, proof*

Item Characteristics:

- a) Items may ask students to draw a conclusion and use evidence or information from a given situation and/or inductive or deductive reasoning to support the conclusion.
- b) Items may ask students to use evidence or information from a given situation and inductive or deductive reasoning to support a given conclusion.
- c) Items may ask students to use evidence or information from a given situation, inductive or deductive reasoning, and/or a counterexample to disprove a given conclusion.
- d) Items may ask students to evaluate procedures used and/or the results based on a given partial or complete solution to a problem.
- e) Items may ask students to identify a valid conclusion based on given information.

Process Strand 6: Solves Problems and Reasons Logically

SR05 (Construct Solutions and Verify Results) Use viable strategies and appropriate concepts and procedures to construct a solution; justify results using inductive and deductive reasoning; check for reasonableness of results; validate thinking and mathematical ideas using models, known facts, patterns, relationships, counterexamples, and/or proportional reasoning (2.2.2, 2.2.3, 3.3.1, 3.3.2, 3.3.3)

Item Format(s)

- Short-Answer and Extended-Response items may be used to test this learning target.

Stimulus, Stem, and Prompt Rules:

- Stimulus may include tables, charts, graphs, text, maps, diagrams, 2- and 3-dimensional figures, statistics, data, or other mathematical information.
- Items will require construction of a solution AND reasoning/reflection about the solution.
- Problem situations may have multiple viable solutions.
- Problems may present real-world situations that could be encountered by tenth graders.

Mathematical Vocabulary and Terms:

- All vocabulary and terms allowed and restricted in content strand specifications apply to Solves Problems and Reasons Logically items.
- Terms that may be used: *conclusion, justify, solution, solve, strategy, support*
- Terms that may be used with definitions or examples: *validate*
- Terms that may not be used: *viable, work backward, write an equation* or other specific names of problem-solving strategies

Item Characteristics:

- a) Items may ask students to use various concepts, procedures, and problem-solving strategies to construct a solution for a given situation and then to explain why the solution is appropriate and/or make a comparison using evidence and information from the problem situation, known facts, patterns, relationships, counter-examples, and proportional reasoning.
- b) Items may ask students to use various concepts, procedures, and problem-solving strategies to construct a solution for a given situation and then to check for reasonableness of results.

Process Strand 7: Communicates Understanding

CU01 (Gather Information) Develop or select an efficient system for collecting mathematical information for a given purpose; extract mathematical information for a given purpose from multiple sources using reading and observation (4.1.1, 4.1.2)

Item Format(s):

- Short-Answer and Extended-Response items may be used to test this learning target.

Stimulus, Stem, and Prompt Rules:

- Stimulus may include mathematical information embedded in pictures, symbols, text, tables, charts, graphs, diagrams, and models.
- Mathematical information from data sources such as magazines, newspapers, menus, brochures, schedules, tax tables, or billing statements may be used.
- Plans may be related to activities such as conducting research, planning an event, building something, baking or cooking, planning a purchase or budgeting, creating a time line, writing a story, etc.

Mathematical Vocabulary and Terms:

- All vocabulary and terms allowed or restricted in content strand specifications apply to Communicates Understanding items.
- Terms that may be used: *irrelevant, plan, procedure, relevant*
- Terms that may be used with definitions or examples:
- Terms that may not be used:

Item Characteristics:

- a) Items may ask students to develop and describe a plan, not a survey, for gathering mathematical information to answer a question.
- b) Items may ask students to list or describe the general procedure/order of steps of a plan, not a survey, to gather exactly the information sought and no irrelevant information.
- c) Items may ask students to extract and explain or describe mathematical information from various sources such as pictures, symbols, text, tables, charts, graphs, diagrams, and models for a purpose.
- d) Items may ask students to write questions that could be answered using data sources such as magazines, newspapers, menus, sales and travel brochures, TV and bus schedules, or sales receipts.

Process Strand 7: Communicates Understanding

CU02 (Organize, Represent and Share Information) Organize, clarify, and refine mathematical information for a given purpose; use everyday and mathematical language and notation in appropriate and efficient forms to clearly express or represent complex ideas and information; explain and/or represent complex mathematical ideas and information in ways appropriate for audience and purpose in a context that is relevant to tenth grade students (4.2.1, 4.2.2, 4.2.3)

Item Format(s):

- Short-Answer and Extended-Response items may be used to test this learning target.

Stimulus, Stem, and Prompt Rules:

- Stimulus may include expository text, tables of data, graphs, charts, algebraic equations, figures and/or coordinate grids.
- Grids and/or circles will be provided for items requiring students to represent information graphically.

Mathematical Vocabulary and Terms:

- All vocabulary and terms allowed or restricted in content strand specifications apply to Communicates Understanding items.
- Terms that may be used: *audience, organize, Venn Diagram*
- Terms that may be used with definitions or examples:
- Terms that may not be used: *continuous, discrete, tabular*

Item Characteristics:

- Items may ask students to clearly organize mathematical information in a useful format for a given purpose.
- Items may ask students to represent mathematical information using pictures, tables, ~~Venn diagrams, scatter plots~~, 2- or 3-dimensional drawings, or other appropriate forms including titles and labels, appropriate and consistent scale(s), and accurate data display for a given audience and/or purpose.
- Items may ask students to clearly explain or describe mathematical ideas, facts, properties, procedures, or strategies in a way that is appropriate for a given audience and/or purpose using mathematical language and notation.

Deleted: graphs

Process Strand 8: Makes Connections

MC01 (Connections within Mathematics) Use concepts and procedures from multiple mathematics content strands in a given problem or situation; relate and use different mathematical models and representations of the same situation (5.1.1, 5.1.2)

Item Format(s):

- Multiple-Choice and Short-Answer items may be used to test this learning target.

Stimulus, Stem, and Prompt Rules:

- Stimulus may include expository text, tables of data, graphs, charts, algebraic equations, figures, and/or coordinate grids.

Mathematical Vocabulary and Terms:

- All vocabulary and terms allowed or restricted in content strand specifications apply to Makes Connections items.
- Terms that may be used: *equivalent, relationship, represent*
- Terms that may be used with definitions or examples: *model*
- Terms that will not be used: *content area, content strand*

Item Characteristics:

- a) Items may ask students to use concepts and procedures from two or more mathematics concept strands - number sense, measurement, geometric sense, probability and statistics, and algebraic sense.
- b) Items may ask students to identify which of four mathematical models or representations is equivalent to the given mathematical model or representation.
- c) Items may ask students to create a model or representation that is equivalent to a given model or representation, including graphical, numerical, pictorial, geometric, and/or written descriptions.
- d) Items may ask students to create two equivalent mathematical models or representations for a given situation.
- e) Items may ask students to describe how two mathematical models or representations are equivalent.