

Wisconsin Student Assessment System
Criterion-Referenced Test Framework
For the Fall 2005 WKCE Statewide Assessment

**ASSESSMENT FRAMEWORK
SUPPLEMENT**

Mathematics

GRADES 3 through 8 and 10

A QUALITY
EDUCATION
FOR
EVERY
CHILD



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CTB/McGraw-Hill**

This document can be found on the web at www.dpi.state.wi.us/dpi/oea/wkce-crt/math_framework.html

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Overview

Beginning in the 2005–2006 school year, the federal No Child Left Behind Act requires all states to test all students in reading and mathematics in grades 3 through 8 and once in high school (grade 10 under Wisconsin law s. 118.30). These tests are referred to as the Wisconsin Knowledge and Concepts Examination Criterion-Referenced Tests (WKCE-CRT) and will replace WKCE reading and mathematics tests beginning in fall 2005. Student performance on these tests is reported in proficiency categories and used to determine the adequate yearly progress of students at the school, district and state levels. Summative information regarding student performance on statewide assessments can be found at www.dpi.state.wi.us/sig/index.html.

The Wisconsin Department of Public Instruction published a request for proposals to support the development of customized criterion-referenced reading and mathematics tests to be vertically scaled over grades 3 through 8 and grade 10. CTB/McGraw-Hill was awarded the contract. Panels of Wisconsin teachers began meeting during the 2003–2004 school year to select reading passages, establish grade-level descriptors for reading and mathematics and review (accept/reject/edit) all customized items developed by the contractor.

CTB/McGraw-Hill is conducting item pilot testing in May 2004 and forms calibration in December 2004 based on a stratified sampling design drawing from all public schools in the state. The Wisconsin Department of Public Instruction also contracted with three national experts to evaluate the work of CTB/McGraw-Hill as well as to advise the department on issues of validity and reliability of the new WKCE-CRT test design for reading and mathematics. This Technical Advisory Committee (TAC) met initially in February 2004 and will meet twice annually in the future to assure the continued technical validity of the tests.

General Test Specifications

All test items developed for the new WKCE-CRT tests in reading and mathematics are either selected-response (multiple-choice) or constructed-response format. The test reporting categories and items assigned to measure each reporting category are aligned to the Wisconsin Model Academic Standards in reading and mathematics with grade-level appropriate descriptors supporting learning expectations for tests administered in the fall semester. The test design draws approximately 80% of the total score points from selected-response items and 20% of the score points from student-generated constructed-response items.

All students in grades 3 through 8 and 10 will be tested in reading and mathematics using these new customized WKCE-CRT tests beginning in fall 2005. Students with disabilities will be allowed accommodations during these tests unless an alternate assessment is required based on an IEP process. Students whose English language proficiency as tested on state-approved language proficiency examinations is level three or higher will take the WKCE-CRT tests with allowable accommodations. English language learners with language proficiency scores less than three will take an alternate assessment. All alternate assessments are aligned to state standards.

Students in grades 4, 8 and 10 will continue to be assessed in language arts, science and social studies as required by s. 118.30 Wisconsin Statutes. These assessments will be a shelf-test provided under the terms of the department's contract with CTB/McGraw-Hill.

WKCE-CRT MATHEMATICS

REPORTING CATEGORIES

Objectives and Sub-skills

Objective: MATHEMATICAL PROCESS

- Reasoning
- Communication
- Connections
- Representation
- Problem Solving

Objective: NUMBER OPERATIONS AND RELATIONSHIPS

Sub-skills:

- Number Concepts
- Number Computation

Objective: GEOMETRY

Sub-skills:

- Describing Figures
- Spatial Relationships and Transformations
- Coordinate Systems

Objective: MEASUREMENT

Sub-skills:

- Measurable Attributes
- Direct Measurement
- Indirect Measurement

Objective: STATISTICS AND PROBABILITY

Sub-skills:

- Data Analysis and Statistics
- Probability

Objective: ALGEBRAIC RELATIONSHIPS

Sub-skills:

- Patterns, Relations and Functions
- Expressions, Equations and Inequalities
- Properties

**WKCE-CRT MATHEMATICS
REPORTING CATEGORIES**
(80% of score points: selected response/20% constructed-response)

OBJECTIVES AND SUB-SKILLS	Estimated Percentage of Score Points per Grade						
	<u>Gr3</u>	<u>Gr4</u>	<u>Gr5</u>	<u>Gr6</u>	<u>Gr7</u>	<u>Gr8</u>	<u>Gr10</u>
A. MATHEMATICAL PROCESS Reasoning Communication Connections Representation Problem Solving	15	18	18	19	19	22	18
B. NUMBER OPERATIONS AND RELATIONSHIPS Number Concepts Number Computation	21	19	18	19	20	14	10
C. GEOMETRY Describe Figures Spatial Relationships and Transformations Coordinate Systems	19	16	16	16	17	14	16
D. MEASUREMENT Measurable Attributes Direct Measurement Indirect Measurement	15	16	16	15	14	16	16
E. STATISTICS AND PROBABILITY Data Analysis and Statistics Probability	15	15	16	15	14	14	20
F. ALGEBRAIC RELATIONSHIPS Patterns, Relations and Functions Expressions, Equations and Inequalities Properties	15	16	16	16	16	20	20

* Grade 10 point estimate assignment pending item bank review

Characteristics of Mathematics Assessment

Constructed response—three score points: one point reports to assigned content category and two points report to the mathematical process category.

Mathematics Tools (vary by grade)

Manipulatives (provided by test contractor): pattern blocks, tangrams, pentomino

Measuring Tools (provided by test contractor): ruler, protractor

Grade Level	Tools	Tool Features
3	ruler (U.S. customary and metric) pattern blocks	ruler interval: 1/2 inch, centimeter
4	ruler (U.S. customary and metric) pattern blocks pentomino (one asymmetrical shape used for transformational geometry)	ruler interval: 1/4 inch, centimeter
5	ruler (U.S. customary and metric) pattern blocks	ruler interval: 1/8 inch, millimeter
6	ruler (U.S. customary and metric) protractor tangrams	ruler interval: 1/16 inch, millimeter
7	ruler (U.S. customary and metric) protractor	ruler interval: 1/16 inch, millimeter
8	ruler (U.S. customary and metric) protractor	ruler interval: 1/16 inch, millimeter
10	ruler (U.S. customary and metric) protractor	ruler interval: 1/16 inch, millimeter

Calculators (vary by grade, provided by school district)

- **GRADES 3 and 4**

Calculator use is **PROHIBITED** for all sessions of the test.

- **GRADES 5, 6, 7 and 8**

Four-function calculator availability is **REQUIRED** for most sessions of the test.

- All students may use a scientific calculator.
- Districts may permit use of a graphing calculator.

1. Graphing calculator memory must be cleared.
2. Calculators with QWERTY keyboards, infrared capabilities and those that perform symbolic manipulation are not permitted.

- **GRADE 10**

Scientific or graphing calculator availability is **REQUIRED** for most sessions of the test.

- Districts may permit use of a graphing calculator.
 1. Graphing calculator memory must be cleared.
 2. Calculators with QWERTY keyboards, infrared capabilities, and those that perform symbolic manipulation are not permitted.

Suggestions for managing calculator use and test security.

- borrow classroom sets from grades or academic areas not being tested
- encourage teachers to have students bring their own calculator on test day
- provide teachers with extra calculators to use if needed
 1. borrow calculators from other grades or classes
 2. purchase additional calculators
- at grades 5-8, avoid graphing calculator use during pilot testing in May and December 2004
 1. if teachers are unfamiliar with clearing memory
 2. if students do not regularly use them in class

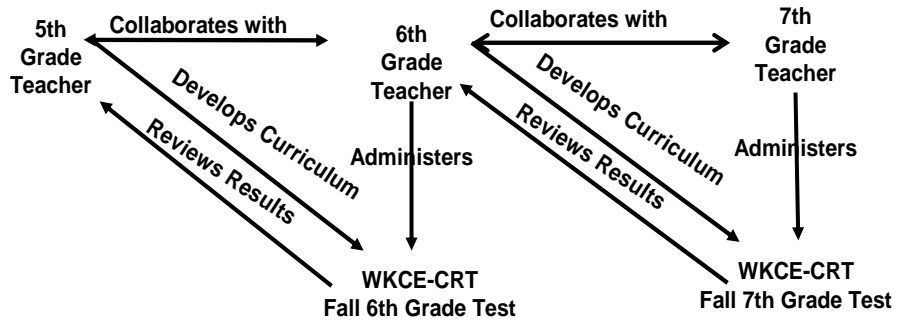
Graphing calculator use is a district decision to be made before the Fall 2005 WKCE-CRT testing window. Use of graphing calculators should be based on the district's mathematics curriculum as well as customary classroom practice. Graphing calculators offer no advantage to test takers, but students in some grades and in some classrooms may be more familiar with such calculators where they are routinely used. The memory function of all graphing calculators permitted at a testing site must be cleared both before and after each testing session.

The information on the following pages provides a framework to describe what skills in mathematics are being tested at each grade. The descriptions of the reporting categories by objectives and sub-skills provide information about the range and coverage of the mathematics test at each grade. The descriptors represent the item content specifications used to develop customized items for each test form at each grade. The descriptors further offer teachers insight into the test content in order to develop instructional strategies to prepare students for successful performance on the test.

Remember: Assessment Framework is for the fall of each tested grade.

To illustrate, the WKCE-CRT Fall Grade 6 Mathematics Assessment Framework outlines the content of the test administered in the fall of Grade 6. This means that most of the descriptors identified in the fall Grade 6 test should be part of the curriculum prior to grade 6.

Fall Test Reflects Previous Grade



Wisconsin Knowledge and Concepts Examinations
Criterion Referenced Test
Mathematics Rubrics

Grades 3-8 Rubric for Brief Constructed Response Questions

- 2 points** The student demonstrates a thorough understanding of the mathematical concepts and/or procedures represented in the problem. The student uses appropriate mathematical procedures and/or concepts to explain or justify the response to Step A, and provides clear and complete explanations and interpretations containing words, calculations, or symbols, unless otherwise specified in the item stem.
- The response may contain minor flaws that do not detract from the demonstration of a thorough understanding of the problem.
- 1 point** The student demonstrates only a partial understanding of the mathematical concepts and/or procedures represented in the problem. The response lacks an essential understanding of the underlying mathematical concepts used to provide the response to Step A.
- The response contains errors related to the misinterpretation of important aspects of the problem, misuse of mathematical procedures and/or concepts, or misinterpretation of results.
- 0 points** The student provides a completely incorrect explanation or justification, or one that cannot be interpreted.

At grades 3-8, the brief constructed response questions are worth a total of 3 points which are assigned as follows:

- 1 point: Mathematical Content
- 2 points: Mathematical Process

The item bank contains constructed response items from all mathematics objectives:

- Mathematical Process
- Number Operations and Relationships
- Geometry
- Measurement
- Statistics and Probability
- Algebraic Relationships

Wisconsin Knowledge and Concepts Examinations
Criterion Referenced Test
Mathematics Rubrics

Grade 10 Rubric for Brief Constructed Response Questions

- 2 points** The student demonstrates a thorough understanding of the mathematical concepts and/or procedures represented in the problem. The student responds correctly to the problem, uses mathematical procedures and/or concepts, and provides clear and complete explanations and interpretations containing words, diagrams, or calculations unless otherwise specified. The response may contain minor flaws that do not detract from the demonstration of a thorough understanding of the problem.
- 1 point** The student provides a response that is only partially correct. The student provides a correct solution, but may demonstrate a misunderstanding of the underlying mathematical concepts and/or procedures. The student provides a correct solution, but in place of showing his/her work writes, “I used my calculator.” The student provides a thorough demonstration of understanding the problem, but states an incorrect solution or conclusion.
- 0 points** The student provides a completely incorrect solution, a response that cannot be interpreted, or no response at all.

Grade 10 Rubric for Extended Constructed Response Questions

- 4 points** The student demonstrates a thorough understanding of the mathematical concepts and/or procedures represented in the problem. The student responds correctly to the problem, uses mathematical procedures and/or concepts, and provides clear and complete explanations and interpretations containing words, diagrams, or calculations unless otherwise specified.
- The response may contain minor flaws that do not detract from the demonstration of a thorough understanding of the problem.
- 3 points** The student demonstrates an understanding of the mathematical concepts and/or procedures represented in the problem. The student’s response to the problem is essentially correct. The mathematical procedures and/or concepts used and the explanations and interpretations provided demonstrate an essential but less than thorough understanding of the problem.

3 points (continued)

The response may contain minor errors that reflect inattentive execution of mathematical procedures and/or concepts, or minor errors indicating of some misunderstanding of the underlying mathematical concepts and/or procedures.

2 points

The student demonstrates only a partial understanding of the mathematical concepts and/or procedures represented in the problem. Although the student may have used the correct approach to obtain a solution or may have provided a correct solution, the response lacks an essential understanding of the underlying mathematical concepts.

The response contains errors related to the misinterpretation of important aspects of the problem, misuse of mathematical procedures and/or concepts, or misinterpretation of results.

1 point

The student demonstrates a very limited understanding of the mathematical concepts and/or procedures represented in the problem. The response is incomplete and exhibits many flaws. Although the response may have addressed some of the conditions of the problem, the conclusion is inadequate and/or includes reasoning that was faulty or incomplete.

The response exhibits many errors or may be incomplete.

0 points The student provides a completely incorrect solution, a response that cannot be interpreted, or no response at all.

*** The student will not receive points for writing, “I used my calculator” on any part of the problem in place of showing his/her work.**

The item bank for brief constructed response and extended constructed response questions contains items from all mathematics objectives:

- Mathematical Process
- Number Operations and Relationships
- Geometry
- Measurement
- Statistics and Probability
- Algebraic Relationships

WKCE-CRT Fall Grade 3 Mathematics Assessment Framework

Objective: Mathematical Processes

Students will effectively use mathematical knowledge, skills and strategies related to reasoning, communication, connections, representation and problem solving.

Descriptors, such as but not limited to

- Use reasoning and logic to perceive patterns, formulate questions, identify relationships, pose problems, make and test conjectures, and evaluate and justify strategies
- Effectively use the vocabulary of mathematics and communicate mathematical ideas and logical arguments in a variety of ways e.g. using words, numbers, symbols, charts, tables, diagrams, graphs, and models.
- Connect mathematics to the real world, as well as within mathematics.
- Create and use representations to organize, record, and communicate mathematical ideas.
- Solve and analyze routine and non-routine problems.

Objective: Number Operations and Relationships**Sub-skill: Concepts****Descriptors, such as but not limited to**

- Apply place-value concepts and numeration to counting, ordering and grouping with numbers less than 1,000 including symbolic renaming and expanded form of two-digit numbers e.g., $24=30-6$; $45=35+10$.
- Read, write, represent numbers with words, numerals, pictures, number lines, base-ten blocks, arrays, expanded forms ($24=20+4$) and symbolic renaming e.g., $24=20+?$.
- Count, order and compare whole numbers less than 1,000, including counting by 2s, 3s, 5s, 10s, 25s and 100s.
- Count, compare and make change using a collection of coins (up to one dollar) and one-dollar bills.
- Identify a fractional part of a collection/set and read, write and represent fractional parts of a whole e.g., $\frac{1}{4}$, $\frac{1}{2}$.

Sub-skill: Computation**Descriptors, such as but not limited to**

- Use addition and subtraction in everyday situations and solve one-step word problems with single or double digits including regrouping.
- Solve single and double-digit addition and subtraction problems with regrouping using horizontal format in problems with and without context.
- Demonstrate understanding of the concept of division as repeated subtraction, partitioning/sharing or measuring (dividend up to 30 and divisors up to 5).
- Demonstrate understanding of multiplication as grouping or repeated addition.
- Demonstrate the concept of multiplication as grouping or repeated addition in context with products up to 50.
- Use fractions to represent quantities when solving problems involving equal sharing or partitioning.
- Estimate sums to tens and hundreds and differences to ten.
- Determine reasonableness of answers.

Objective: Geometry

Sub-skill: Describing figures

Descriptors, such as but not limited to

- Describe, compare and identify pattern block shapes (e.g., triangle, hexagon, trapezoid and parallelogram) and properties of 2-and 3-dimensional regular figures by comparing sides, faces, corners, and edges of circles, squares, triangles, rectangles, spheres, cubes, cylinders, pyramids and rectangular prisms.

Sub-skill: Spatial relationships and transformations

Descriptors, such as but not limited to

- Identify 2-dimensional geometric shapes created by combining or decomposing other shapes e.g., square/triangles; trapezoid/rhombus, triangle; hexagon/triangles, rhombus, trapezoid.
- Apply concepts of single-motion geometry e.g., slides, flips and turns to match two identical shapes.

Sub-skill: Coordinate systems

Descriptors, such as but not limited to

- Use simple 2-dimensional coordinate systems to find locations on maps and to represent points and simple figures with coordinates of letters and numbers.

Objective: Measurement

Sub-skill: Measurable attributes

Descriptors, such as but not limited to

- Describe attributes of length, time and temperature and identify appropriate units to measure them e.g., units to include: inches, feet, yards, centimeters, seconds, minutes, hours, days, months, years and degrees F/C.
- Compare attributes of length and weight by observation or actual measurements.

Sub-skill: Direct measurement

Descriptors, such as but not limited to

- Read and interpret measuring instruments to determine the measurement of objects with non-standard and standard units to the nearest centimeter or 1/2-inch.
- Read thermometers to the nearest 5 degrees F/C.
- Tell time to the nearest minute using analog and digital clocks; translate time on both analog and digital clocks.
- Investigate measurements of area.

Sub-skill: Indirect measurement

Descriptors, such as but not limited to

- Apply estimation techniques using non-standard units.

Objective: Statistics and Probability

Sub-skill: Data analysis and statistics

Descriptors, such as but not limited to

- Work with data in the context of real-world situations by determining what data to collect and when and how to collect it to answer questions.
- Collect, organize and display data in simple bar graphs and charts including translating data from one form to the other.
- Draw reasonable conclusions based on simple interpretations of data.
- Read, use information and draw reasonable conclusions from data in graphs, tables, charts and Venn diagrams.

Sub-skill: Probability

Descriptors, such as but not limited to

- Determine if the occurrence of future events are more, less or equally likely to occur.
- Choose a fair and an unfair spinner.

Objective: Algebraic Relationships

Sub-skill: Patterns, relations and functions

Descriptors, such as but not limited to

- Recognize, extend, describe, create and replicate a variety of patterns including attribute, number and geometric patterns, focusing on relationships within patterns as well as extending patterns e.g., patterns and relationships represented with pictures, tables and charts, and “what’s-my-rule?” patterns using addition and subtraction rules.
- Determine odd or even with a total set of 12 or less.

Sub-skill: Expressions, equations and inequalities

Descriptors, such as but not limited to

- Demonstrate an understanding that the “=” sign means “the same as” by solving open or true/false number sentences.
- Use notation to represent mathematical thinking: letter or box (variable); operation symbols (+, -, =).

Sub-skill: Properties

Descriptors, such as but not limited to

- Use properties or relational thinking to reason about what number goes in a box to make a number sentence true, e.g., zero property $12 + 0 = \text{box}$, adding 1 to any number, commutative property for addition single-digits, place value in 1’s and 10’s.
- Use simple equations in a variety of ways.

WKCE-CRT Fall Grade 4 Mathematics Assessment Framework

Objective: Mathematical Processes

Students will effectively use mathematical knowledge, skills and strategies related to reasoning, communication, connections, representation and problem solving.

Descriptors, such as but not limited to

- Use reasoning and logic to perceive patterns, formulate questions, identify relationships, pose problems, make and test conjectures, and evaluate and justify strategies.
- Effectively use the vocabulary of mathematics and communicate mathematical ideas and logical arguments in a variety of ways e.g., using words, numbers, symbols, charts, tables, diagrams, graphs, and models.
- Connect mathematics to the real world, as well as within mathematics.
- Create and use representations to organize, record, and communicate mathematical ideas.
- Solve and analyze routine and non-routine problems.

Objective: Number Operations and Relationships**Sub-skill: Concepts****Descriptors, such as but not limited to**

- Apply place-value concepts and numeration to counting, ordering and grouping with numbers less than 10,000 including symbolic renaming and expanded form of three-digit numbers e.g., $243=200 + 40 + 3$.
- Read, write and represent numbers in words, numerals, pictures, pictorial, number lines, base-ten blocks, arrays, expanded forms ($243=200+40+3$) and symbolic renaming.
- Count, order and compare whole numbers less than 10,000 including counting by 2s, 3s, 5s, 10s, 25s starting with any multiple and 100s starting with any number.
- Identify and name counting patterns.
- Count, compare and make change up to \$10.00 using a collection of coins and one-dollar bills.
- Identify a fractional part of a collection/set or parts of a whole and read, write, order and represent unit fractions and part(s) of a set.

Sub-skill: Computation**Descriptors, such as but not limited to**

- Use addition and subtraction in everyday situations and solve one-and two-step word problems with single or double digit including regrouping.
- Solve double-and triple-digit addition and subtraction problems with regrouping in horizontal and vertical format in problems with and without context.
- Demonstrate understanding of the concept of division as repeated subtraction, partitioning/sharing or measuring (dividend up to 45 and divisors up to 5).
- Demonstrate understanding of multiplication as grouping or repeated addition or arrays in problems with and without context (without context up to 5×9 ; in context products up to 100).
- Use fractions to represent quantities when solving problems involving equal sharing or partitioning including fractions less than one as well as mixed numbers; represent with shaded circles, rods, squares or pictorial representations of objects (for a set).
- Estimate sums to tens, hundreds and thousands and differences of ten and hundreds.
- Determine reasonableness of answers.

Objective: Geometry

Sub-skill: Describe figures

Descriptors, such as but not limited to;

- Describe, compare and identify pattern block shapes (e.g. hexagon, parallelogram, trapezoid, and triangle) and properties of 2-and 3- dimensional regular figures by comparing sides, faces, corners and edges of circles, squares, triangles, rectangles, spheres, cubes, cylinders, pyramids, rectangular prisms and tetrahedrons.

Sub-skill: Spatial relationships and transformations

Descriptors, such as but not limited to

- Create and identify 2-dimensional geometric shapes by combining or decomposing other shapes.
- Identify cubes and square pyramid shapes from their nets (flat patterns).
- Apply concepts of single-motion geometry e.g., slides, flips and turns to match two identical shapes.

Sub-skill: Coordinate Systems

Descriptors, such as but not limited to

- Identify and use relationships among figures e.g., location, position and intersection.
- Use simple 2-dimensional coordinate systems to find locations on maps and to represent points and simple figures with coordinates using letters and numbers.

Objective: Measurement

Sub-skill: Measurable attributes

Descriptors, such as but not limited to

- Describe attributes of length, time, temperature, liquid capacity, weight, volume and identify appropriate units to measure them e.g., inches, centimeters, miles, feet, yards, millimeters, quarts, cups, gallons, liters, seconds, minutes, hours, days, months, years, pounds, ounces, grams and degrees F/C.
- Compare attributes of length, volume and weight by observation or actual measurements.
- Make measurement conversions: feet to yard; inches to feet; minutes to hours; hours to days; months to years; quarts to gallons.

Sub-skill: Direct measurement

Descriptors, such as but not limited to

- Read and interpret measuring instruments to determine the measurement of objects with non-standard and standard units to the nearest centimeter, 1/2-and 1/4-inch, and thermometers to the nearest 5 degrees F/C.
- Tell time to the nearest minute and translate time on both analog and digital clocks.
- Determine and compare elapsed time in multiples of 15 minutes in problem-solving situations.
- Investigate measurements of area and perimeter.

Sub-skill: Indirect measurement

Descriptors, such as but not limited to

- Apply estimation techniques using non-standard units.

Objective: Statistics and Probability

Sub-skill: Data analysis and statistics

Descriptors, such as but not limited to

- Work with data in the context of real-world situations by formulating questions that lead to data collection and analysis and determining what data to collect and when and how to collect it.
- Collect, organize and display data in simple bar graphs and charts.
- Draw reasonable conclusions based on simple interpretations of data.
- Read, use information and draw reasonable conclusions from data in graphs, tables, charts and Venn diagrams.

Sub-skill: Probability

Descriptors, such as but not limited to

- Determine if the occurrence of future events are more, less or equally likely to occur.
- Design a fair and an unfair spinner.
- Design and measure the outcome of a simple event using words to describe probability e.g., out of _____ how many chances _____?; chances out of _____?.

Objective: Algebraic Relationships

Sub-skill: Patterns, relations and functions

Descriptors, such as but not limited to

- Recognize, extend, describe, create and replicate a variety of patterns including attribute, number and geometric patterns focusing on relationships within patterns as well as extending patterns e.g., patterns and relationships represented with pictures, tables and charts; “what’s-my-rule?” patterns using addition and subtraction rules.
- Determine odd or even.

Sub-skill: Expressions, equations and inequalities

Descriptors, such as but not limited to

- Demonstrate an understanding that the “=” sign means “the same as” by solving open or true/false number sentences.
- Use notation to represent mathematical thinking: letter or box (variable); operation symbols (+, -, =).

Sub-skill: Properties

Descriptors, such as but not limited to

- Use properties or relational thinking to reason about what number goes in a box to make a number sentence true e.g., zero property $12 + 0 = \text{box}$, adding 1 to any number, commutative property for addition, place value in 10’s and 100’s ($20 + 5 = 10 + 10 + 5$).
- Use simple equations in a variety of ways.

WKCE-CRT Fall Grade 5 Mathematics Assessment Framework

Objective: Mathematical Processes

Students will effectively use mathematical knowledge, skills and strategies related to reasoning, communication, connections, representation and problem solving.

Descriptors, such as but not limited to

- Use reasoning and logic to perceive patterns, formulate questions, identify relationships, pose problems, make and test conjectures, and evaluate and justify strategies.
- Effectively use the vocabulary of mathematics and communicate mathematical ideas and logical arguments in a variety of ways e.g., using words, numbers, symbols, charts, tables, diagrams, graphs, and models.
- Connect mathematics to the real world, as well as within mathematics.
- Create and use representations to organize, record, and communicate mathematical ideas.
- Solve and analyze routine and non-routine problems.

Objective: Number Operations and Relationships**Sub-skill: Concepts****Descriptors, such as but not limited to**

- Apply place values concepts and numeration to pictorial models e.g., (arrays), symbolic renaming (e.g., $4,568 = 5,000 - 432$) and expanded form (e.g., $9,473 = 9,000 + 400 + 70 + 3$) to whole numbers less than 1,000,000 in words, digital value and numbers.
- Count, read, write, compare, order and represent numbers less than 10,000 using pictures, numbers, arrays, symbols ($<$, $>$, $=$) and words.
- Identify and use factors and multiples of basic facts and basic divisibility rules e.g., 2, 5, 10, 25.
- Estimate with visual models or number lines e.g., if the distance from a to b is 1 mile, how far is it from a to c?
- Read, write, represent, count, order, compare and make change using a collection of coins and bills equal to and less than \$20.00.
- Read, write, identify, represent and rename improper fractions; order and compare fractions representing parts of a set and parts of a whole as numbers and visual models with numerators and denominators less than or equal to 10.

Sub-skill: Computation**Descriptors, such as but not limited to**

- Compute in everyday contexts with one operation ($+$, $-$, \times , \div) and in non-contextual problems including:
three-and four-digit addition and subtraction with regrouping; multiplication of two-digit by one-digit numbers; division with single-digit divisors and two-digit dividends and with two-step or mixed operation problems with single-digit numbers.
- Use basic multiplication and division facts when solving problems.
- Add and subtract fractions with like denominators and decimals in the context of money.
- Estimate: multiplication of two-digit by one-digit problems, addition and subtraction of decimals using money, and division in context.
- Determine reasonableness of answers.

Objective: Geometry

Sub-skill: Describe figures

Descriptors, such as but not limited to

- Identify, describe and compare properties of 2-and 3-dimensional figures, comparing sides, faces, corners, vertices and edges of regular figures including parallel and perpendicular lines and line segments.
- Determine the number of faces, edges and vertices given an illustration of a 3-dimensional figure.

Sub-skill: Spatial relationships and transformations

Descriptors, such as but not limited to

- Use pattern blocks and geoboards to describe, model and construct plane figures.
- Use slides, flips and turns on figures. Identify congruent shapes using figures that have been manipulated by one or two motions (slides, flips and turns).
- Identify cubes, rectangular and triangular prisms and rectangular and triangular pyramids from simple nets (flat patterns).
- Describe 3-dimensional shapes from multiple perspectives.
- Discern a shape with one line of symmetry.

Sub-skill: Coordinate systems

Descriptors, such as but not limited to

- State the coordinates of locations or objects on simple maps and grids.
- Plot the points on a one-quadrant coordinate grid.

Objective: Measurement

Sub-skill: Measurable attributes

Descriptors, such as but not limited to

- Identify appropriate units to measure length, liquid capacity, time, weight, temperature, volume (units to include: inches, feet, yards, centimeters, millimeters, cups, quarts, gallon, liters, seconds, minutes, hours, ounces, pounds, grams, kilograms and degrees F/C).
- Compare attributes of length and weight by direct observation or actual measurements.
- Make measurement conversions within a system e.g., feet to yards; inches to feet; quart to gallons; millimeters to centimeters; centimeters to millimeters.

Sub-skill: Direct measurement

Descriptors, such as but not limited to

- Read, interpret and use measuring instruments to determine the measurement of objects with standard units to the nearest $\frac{1}{4}$ - inch or $\frac{1}{2}$ - inch or centimeter.
- Convert customary units of measure e.g., feet to yards; inches to yards; inches to feet; centimeters to meters; grams to kilograms; quarts to gallons; cups to pints.
- Read thermometers to the nearest five degrees F/C and read a scale to the nearest ounce or five grams.
- Translate time on an analog clock to a digital clock and vice versa.
- Determine and compare elapsed time in problem-solving situations.

Sub-skill: Indirect Measurement

Descriptors, such as but not limited to

- Estimate measurement using U.S customary measurements.
- Determine perimeter and area of regular shapes and the area of plane rectangular shapes and area of irregular shapes when given a reference point such as a grid.

Objective: Statistics and Probability

Sub-skill: Data analysis and statistics

Descriptors, such as but not limited to

- Formulate questions to collect, organize and display data.
- Read and interpret information from single bar graphs, line plots, picture graphs and Venn diagrams.
- Use data to predict outcomes or trends from graph or table.
- Draw conclusions based on data.
- Describe a given set of data of seven items/numbers or fewer using the terms range, mode and median in problems with and without context.

Sub-skill: Probability

Descriptors, such as but not limited to

- Determine if future events are more, less or equally likely, impossible or certain to occur.
- Predict outcomes of future events and test predictions using data from a variety of sources and words to express probability.

Objective: Algebraic Relationships

Sub-skill: Patterns, relations and functions

Descriptors, such as but not limited to

- Recognize, extend, describe, create and replicate a variety of patterns including attribute, numeric and geometric patterns.
- Describe a rule that explains a functional relationship or pattern using addition, subtraction or multiplication rules and regressions.
- Determine a future event in a pattern up to the eighth item when given the first five.
- Represent patterns and relationships with pictures, tables and charts.

Sub-skill: Expressions, equations and inequalities

Descriptors, such as but not limited to

- Solve simple one-step open sentences including missing factor in problems with and without context e.g., “box” or letter variable and whole number coefficients.
- Solve simple one-step open sentences involving all operations in context.
- Represent problem situations with one-step equations involving multiplication and division with simple open sentences.
- Demonstrate a basic understanding of equality and inequality using symbols ($<$, $>$, $=$) with all operations.

Sub-skill: Properties

Descriptors, such as but not limited to

- Use the commutative property of multiplication with positive single digits.
- Use the inverse relationship of division and multiplication with single digit, whole numbers.
- Demonstrate understanding of order of operations by solving two-step open sentences involving all operations.

WKCE-CRT Fall Grade 6 Mathematics Assessment Framework

Objective: Mathematical Processes

Students will effectively use mathematical knowledge, skills and strategies related to reasoning, communication, connections, representation and problem solving.

Descriptors, such as but not limited to

- Use reasoning and logic to perceive patterns, formulate questions, identify relationships, pose problems, make and test conjectures, and evaluate and justify strategies.
- Effectively use the vocabulary of mathematics and communicate mathematical ideas and logical arguments in a variety of ways e.g., using words, numbers, symbols, charts, tables, diagrams, graphs, and models.
- Connect mathematics to the real world, as well as within mathematics.
- Create and use representations to organize, record, and communicate mathematical ideas.
- Solve and analyze routine and non-routine problems.

Objective: Number Operations and Relationships**Sub-skill: Concepts****Descriptors, such as but not limited to**

- Apply place values concepts and numeration to pictorial models (e.g., arrays), symbolic renaming e.g., $(4,568 = 5,000 - 432)$ and expanded form e.g., $(9,473 = 9,000 + 400 + 70 + 3)$ to whole numbers less than 10,000,000 in words, digital value and numbers.
- Count, read, write, compare, order and represent numbers less than 100,000 using pictures, numbers, arrays, symbols ($<$, $>$, $=$) and words.
- Identify prime, composite, multiples, common multiples and factors, least common multiple through 24 and greatest common factor through 50; recognize divisibility potential of numbers (1-10).
- Read, write, identify, represent, order and compare monetary units as parts of a dollar and benchmark percents of a whole with visual models.
- Read, write, identify, order, compare and represent equivalent and mixed fractions with visuals using parts of a whole and parts of a set; rename improper fractions to mixed numbers and rename to lowest terms; identify and represent equivalence between fractions, percents, and decimals.
- Demonstrate basic understanding of proportionality using scale-map and other proportional contexts.

Sub-skill: Computation**Descriptors, such as but not limited to**

- Compute in everyday contexts with one operation ($+$, $-$, \times , \div) and in non-contextual problems including:
three and four-digit addition and subtraction with regrouping, multiplication of three-digit by two-digit numbers, division with single-digit divisors and four-digit dividends with two-step or mixed operation problems.
- Use basic multiplication and division facts when solving problems.
- Rename improper fractions; add and subtract fractions with unlike denominators, e.g., halves, thirds, fourths, with sums or differences 0-1.
- Compute with decimals in the context of money and make change.
- Estimate using basic whole number operations, benchmark fractions and benchmark decimals.
- Determine reasonableness of answers.

Objective: Geometry

Sub-skill: Describing figures

Descriptors, such as but not limited to

- Recognize and name regular polygons with 3, 4, 5, 6 or 8 sides.
- Identify lines and line segments in a plane figure.
- Classify plane figures by characteristics of angles (acute, obtuse and right) and describe rays found in open-angle situations.

Sub-skill: Spatial relationships and transformations

Descriptors, such as but not limited to

- Identify congruence and/or similarity between figures.
- Describe and compare cubes, rectangular and triangular prisms and rectangular and triangular pyramids from nets (flat patterns).
- Recognize and describe 3-dimensional shapes from multiple perspectives.
- Identify lines of symmetry and the number of lines of symmetry in figures and design shapes that have at least one line of symmetry.
- Use slides, flips and turns on figures.

Sub-skill: Coordinate systems

- Identify the coordinates of locations or objects on simple one quadrant grids using numbers only for coordinates, e.g., (3, 2).
- Locate the fourth coordinate pair when given three vertices of a quadrilateral on a coordinate grid.

Objective: Measurement

Sub-skill: Measurable attributes

Descriptors, such as but not limited to

- Identify appropriate units to measure length, liquid capacity, time, weight, temperature, volume (units to include: inches, feet, yards, centimeters, millimeters, cups, quarts, gallons, liters, seconds, minutes, hours, ounces, pounds, gram, kilograms including mixed measures e.g., 1 foot, 3 inches; 1 hour, 15 minutes) and degrees F/C.
- Use direct observation or actual measurements to compare attributes of length to the nearest 1/4-inch and volume and weight to the nearest pound.
- Convert measurement within a system: feet to yards; inches to feet; quarts to gallons; millimeters to centimeters.

Sub-skill: Direct measurement

Descriptors, such as but not limited to

- Read and interpret measuring instruments to determine the measurement of objects with standard units (U.S. customary).
- Convert customary units of measure e.g., feet to yards; inches to yards; inches to feet; centimeters to meters; grams to kilograms; quarts to gallons; cups to pints.
- Measure to the 1/4-inch, 1/8-inch, centimeter or millimeter.
- Determine and compare elapsed time in problem-solving situations.

Sub-skill: Indirect measurement

Descriptors, such as but not limited to

- Estimate measurements using U.S. customary measurement.
- Determine the area of regular shapes including right triangles.
- Determine actual distance between two points using a scale.

Objective: Statistics and Probability

Sub-skill: Data analysis and statistics

Descriptors, such as but not limited to

- Describe data using mean, median and mode.
- Extract, interpret and analyze data from single bar graphs, tables and charts, line plots, context, circle graphs and Venn diagrams.
- Use data to predict outcomes or trends from graphs and tables.
- Draw conclusions based on data.
- Describe a given set of data of ten or fewer items/numbers using the terms mean, median, mode and range to extract information from organized charts, tables, graphs and Venn diagrams in problems with and without context.

Sub-skill: Probability

Descriptors, such as but not limited to

- Determine the likelihood of future events, predict outcomes of future events and test predictions using data from a variety of sources.
- Determine the probability of events in context using words, percents or fractions.
- Describe and determine the number of combinations of three items.

Objective: Algebraic Relationships

Sub-skill: Patterns, relations and functions

Descriptors, such as but not limited to

- Recognize, extend, describe, create and replicate a variety of patterns including attribute, numeric and geometric patterns.
- Describe a rule that explains a functional relationship or pattern using addition, subtraction or multiplication rules and regressions.
- Determine a future event in a pattern up to the tenth item when given the first five.
- Represent patterns and relationships with pictures, table and charts.

Sub-skill: Expressions, equations and inequalities

Descriptors, such as but not limited to

- Solve one-step equations with “box” variable and whole number coefficients in problems with and without context.
- Solve two-step multi-operation equations with “box” or letter variable and whole number coefficients.
- Solve simple two-step, two operation patterns.
- Solve two-step open sentences involving all operations.
- Demonstrate basic understanding of equality and inequality using symbols ($<$, $>$, $=$) with mixed operations.

Sub-skill: Properties

Descriptors, such as but not limited to

- Use the commutative property of multiplication with positive single digits.
- Use the inverse relationship of division and multiplication with single whole digits.
- Evaluate two-step numerical expressions using correct order of operations.
- Demonstrate understanding of distributive property.
- Demonstrate understanding of order of operations by solving two-step open sentences involving all operations.

WKCE-CRT Fall Grade 7 Mathematics Assessment Framework

Objective: Mathematical Processes

Students will effectively use mathematical knowledge, skills and strategies related to reasoning, communication, connections, representation and problem solving.

Descriptors, such as but not limited to

- Use reasoning and logic to perceive patterns, formulate questions, identify relationships, pose problems, make and test conjectures, and evaluate and justify strategies.
- Effectively use the vocabulary of mathematics and communicate mathematical ideas and logical arguments in a variety of ways e.g., using words, numbers, symbols, charts, tables, diagrams, graphs, and models.
- Connect mathematics to the real world, as well as within mathematics.
- Create and use representations to organize, record, and communicate mathematical ideas.
- Solve and analyze routine and non-routine problems.

Objective: Number Operations and Relationships**Sub-skill: Concepts****Descriptors, such as but not limited to**

- Identify correct standard form of numbers to 10,000 with decimal place value to hundredths. Order a set of fractions or decimals and use symbols ($<$, $>$, $=$, \neq) to demonstrate understanding of the relationship between two common fractions, two decimals as well as a common fraction and a decimal in problems with and without context.
- Identify equivalent forms of fractions, decimals and percents.
- Identify primes, composites, multiples, factors, common multiples, common factors and least common multiple and greatest common factor of two numbers.
- Make comparisons using ratios and rates and use proportional thinking (without setting up a formal proportion).
- Apply percents to discount and sales tax and demonstrate understanding of percents in problems with context e.g., Six is what percent of eight?; Joe got six questions correct and two were wrong, what percent did he get correct?.

Sub-skill: Computation

- Add and subtract mixed numbers and fractions with unlike denominators and decimals up to thousandths; multiply fractions and decimals up to hundredths.
- Divide decimals up to hundredths by single-digit divisors in problems with and without context including monetary context with parts of a dollar remainders; demonstrate understanding of the concept of division of fractions in a contextual setting.
- Solve problems involving percents e.g., 75 percent of 200 is __; 150 is __percent of 200.
- Estimate the sum, difference and product of whole numbers, common fractions, mixed numbers and decimals to hundredths and estimate benchmark fractions.
- Determine reasonableness of answers.

Objective: Geometry**Sub-skill: Describing figures****Descriptors, such as but not limited to**

- Name regular and irregular polygons up to eight sides and identify and justify by characteristics whether a shape is a polygon.
- Determine the number of faces, edges and vertices given an illustration of a 3-dimensional figure.
- Identify shapes according to characteristics such as parallel and perpendicular lines; identify right, acute and obtuse angles with varied orientations.

Sub-skill: Spatial relationships and transformations

Descriptors, such as but not limited to

- Identify figures that are congruent and/or similar.
- Recognize and describe 3-dimensional shapes from multiple perspectives.
- Draw and/or describe a similar figure when given a polygon drawn on graph paper with vertices at lattice points.
- Demonstrate understanding of similarity by finding the relationship between the sides of two figures.
- Draw or identify lines of symmetry when given a figure with 0, 1 or 2 lines of symmetry.
- Draw or identify the reflection, rotation or translation of a given figure.

Sub-skill: Coordinate systems

Descriptors, such as but not limited to

- Identify coordinates in the first quadrant
- Locate or plot coordinates in the first quadrant using a geometric context.

Objective: Measurement

Sub-skill: Measurable attributes

Descriptors, such as but not limited to

- Convert units within a system e.g., feet to yards; ounces to pounds; inches to feet; pints to quarts.
- Select the appropriate unit of measure to estimate the length of everyday objects using U.S. customary and metric.

Sub-skill: Direct measurement

Descriptors, such as but not limited to

- Measure and/or draw angles up to 180 degrees.
- Apply appropriate tools, techniques and formulas to measure to the nearest 1/4-, 1/8- or 1/16-inch or nearest centimeter or millimeter.
- Determine and compare elapsed time in problem-solving situations.

Sub-skill: Indirect measurement

Descriptors, such as but not limited to

- Determine the actual distance between two points using a scale.
- Determine perimeter/circumference and area of squares, rectangles, triangles, circles and parallelograms in real-world context.
- Estimate area given a reference.

Objective: Statistics and Probability

Sub-skill: Data analysis and statistics

Descriptors, such as but not limited to

- Extract, interpret and analyze data from tables, simple stem-and-leaf plots, simple bar graphs, line plots, line graphs, simple circle graphs, charts and diagrams.
- Evaluate a set of data to generate or confirm/deny hypotheses.
- Find mean, median (with odd set of data), mode and range of a set of data with and without context.
- Create graph with one-variable data sets using simple stem-and-leaf plots, bar graphs, circle graphs, line plots and line graphs; discuss appropriateness of graphs selected.
- Summarize data sets in tables, charts and diagrams with and without context.
- Evaluate sources of data in context and evaluate multiple representations of a given data set.

Sub-skill: Probability

Descriptors, such as but not limited to

- Determine the likelihood of an event and probability based on one independent event, e.g., spinning the arrow on a spinner.
- Use data from simulations provided in charts/tables to solve and interpret probability problems.
- Solve problems involving sample spaces or diagrams.
- Use probabilities to estimate outcomes and evaluate fair and unfair simple events.
- Analyze outcomes based on an understanding of theoretical and experimental probability.

Objective: Algebraic Relationships

Sub-skill: Patterns, relations and functions

Descriptors, such as but not limited to

- Describe and analyze functional relationships in two concurrent numeric patterns using addition and subtraction.
- Extend a given arithmetic sequence of pictures or numbers.
- Identify the rule to complete or extend a function table or any combination of the two using one operation (+, -, \times , \div) and numbers (0 through 100) in the function table.
- Describe and interpret linear patterns in tables and graphs.
- Describe real-world phenomena that a given graph might represent.

Sub-skill: Expressions, equations and inequalities

Descriptors, such as but not limited to

- Solve single-variable one-step equations and algebraic expressions with one variable and one operation.
- Demonstrate understanding of equality and inequality and solve single-variable equations using symbols (<, >, +).
- Describe in words the generalization for a given one-operation pattern.
- Evaluate formulas with and without context by solving for a specified variable.

Sub-skill: Properties

Descriptors, such as but not limited to

- Identify a pair of equivalent numerical expressions where the commutative property of either addition or multiplication has been used.
- Demonstrate understanding of distributive property.
- Demonstrate understanding of up to three-step order of operations with and without context using parentheses and exponents.

WKCE-CRT Fall Grade 8 Mathematics Assessment Framework

Objective: Mathematical Processes

Students will effectively use mathematical knowledge, skills and strategies related to reasoning, communication, connections, representation and problem solving.

Descriptors, such as but not limited to

- Use reasoning and logic to perceive patterns, formulate questions, identify relationships, pose problems, make and test conjectures, and evaluate and justify strategies.
- Effectively use the vocabulary of mathematics and communicate mathematical ideas and logical arguments in a variety of ways e.g., using words, numbers, symbols, charts, tables, diagrams, graphs, and models.
- Connect mathematics to the real world, as well as within mathematics.
- Create and use representations to organize, record, and communicate mathematical ideas.
- Solve and analyze routine and non-routine problems.

Objective: Number Operations and Relationships**Sub-skill: Concepts****Descriptors, such as but not limited to**

- Identify standard forms of numbers to 10,000 with decimal place value to thousandths; order a set of fractions, decimals or integers; and use symbols ($<$, $>$, $=$, \neq , \leq , \geq) to demonstrate understanding of the relationship between integers, mixed fractions and decimals to the hundredths place and mixed fractions and decimals.
- Identify equivalent forms of fractions, decimals and percents.
- Identify primes, composites, multiples, factors, common multiples, common factors and least common multiple and greatest common factor of two or three numbers.
- Make comparisons using ratios and rates and use proportional thinking (without setting up a formal proportion).
- Apply percents to discount and sales tax and demonstrate understanding of percents in problems with context including the relationship of percent to whole e.g., 40 is 25 percent of what number?; What number is 25 percent of 160?; 40 is what percent of 160?.

Sub-skill: Computation**Descriptors, such as but not limited to**

- Add and subtract mixed numbers and fractions with unlike denominators, decimals (up to thousandths) and integers (-100 to 100); multiply mixed numbers, decimals (up to hundredths) and integers (-100 to 100); multiply decimal numbers with three significant digits in an appropriate context such as interest rates e.g., interest rate for savings accounts and credit cards.
- Divide decimals (up to hundredths) and integers (-100 to 100) in problems with and without context; demonstrate understanding of the concept of division of fractions in a contextual setting.
- Solve problems involving percents e.g., 75 percent of 200 is __; 150 is __percent of 200.
- Estimate the sum, difference and product of whole numbers, common fractions, mixed numbers and decimals to thousandths.
- Determine reasonableness of answers.

Objective: Geometry

Sub-skill: Describing figures

Descriptors, such as but not limited to

- Name 3-dimensional figures e.g., rectangular prisms, square pyramids, cones, cylinders and spheres.
- Find the measure of the third angle of a triangle when given the measures of two interior or exterior angles.
- Determine the sum of the angles of a polygon using diagonals drawn from one vertex.
- Determine the measure of an angle in a drawing of an adjacent and supplementary or adjacent and complementary pair of angles when given the measure of the other angle.

Sub-skill: Spatial relationships and transformations

Descriptors, such as but not limited to

- Identify figures that are congruent and/or similar.
- Describe 3-dimensional shapes from multiple perspectives.
- Draw and/or describe a similar figure when given a polygon drawn on graph paper with vertices at lattice points.
- Demonstrate understanding of similarity by finding the relationship between the sides of two figures.
- Identify and/or draw all lines of symmetry given a figure with 0, 2, 3, 4 or 5 lines of symmetry.
- Classify figures possessing line symmetry only; line and rotation symmetry; rotational symmetry only; no symmetry.
- Identify and/or draw the reflection, rotation and/or translation of a given figure.

Sub-skill: Coordinate systems

Descriptors, such as but not limited to

- Draw or identify the reflection of a figure across the x- or y-axis or the translation of a figure with vertices at integer coordinates in any of the four quadrants.
- Locate or plot coordinates in any of the four quadrants using a geometric context.

Objective: Measurement

Sub-skill: Measurable attributes

Descriptors, such as but not limited to

- Approximate conversions of units between metric and U.S. customary systems using a model or in context (quart/liter; yard/meter).
- Select the appropriate unit of measure (U.S. customary and metric) to estimate the length and mass/weight of everyday objects.

Sub-skill: Direct measurement

Descriptors, such as but not limited to

- Measure and/or draw angles up to 360 degrees.
- Apply appropriate tools, techniques and formulas to measure to the nearest $\frac{1}{4}$ -, $\frac{1}{8}$ - or $\frac{1}{16}$ -inch or nearest centimeter or millimeter.

Sub-skill: Indirect measurement

Descriptors, such as but not limited to

- Draw similar figures in any shape using a scale factor e.g., enlarge/shrink.
- Determine the actual distance between three points using a scale.
- Determine perimeter/circumference and area of triangles, circles and parallelograms with and without context.
- Determine volume and surface area of cylinders, rectangular prisms and pyramids (with bases of triangle, square, pentagon and hexagon) in real-world context.
- Use $D = rt$ formula in simple contexts.
- Estimate area given a reference.
- Use ratio and proportion in context.

Objective: Statistics and Probability

Sub-skill: Data analysis and statistics

Descriptors, such as but not limited to

- Extract, interpret and analyze data including multiple representations of the same data from tables, double back-to-back stem-and-leaf plots, double bar graphs, simple circle graphs, line plots, line graphs, charts and diagrams with and without context.
- Compare two sets of data to generate or confirm/deny a hypotheses.
- Find mean, median (with odd or even number of data), mode and range of a set of data with and without context.
- Create graph with one-variable data sets using back-to-back stem-and-leaf plots, double bar graphs, circle graphs, line plots and line graphs; discuss appropriateness of graph selected.
- Summarize data sets in tables, charts and diagrams with and without context.
- Evaluate sources of data in context and multiple representations of a give data set.

Sub-skill: Probability

Descriptors, such as but not limited to

- Determine the likelihood of an event and probability based on one or two dependent or independent events.
- Use data from simulations provided in charts/tables to solve and interpret probability problems.
- Solve problems involving sample spaces or diagrams.
- Use probabilities to estimate outcomes and evaluate fair and unfair simple events.
- Analyze outcomes based on an understanding of theoretical and experimental probability.

Objective: Algebraic Relationships

Sub-skill: Patterns, relations and functions

Descriptors, such as but not limited to

- Describe and analyze in words functional relationships in two concurrent numeric patterns using multiplication and exponents.
- Extend an increasing or decreasing arithmetic or geometric pattern.
- Justify the accuracy of the chosen item in a sequence.
- Identify the rule to complete or extend a function table or any combination of the two using one or two operations (+, -, \times , \div) and numbers (-100 through 100) in the function table.
- Describe and interpret linear patterns in tables and graphs.
- Describe real-world phenomena that a given graph might represent.

Sub-skill: Expressions, equations and inequalities

Descriptors, such as but not limited to

- Solve single-variable two-step equations with whole number coefficients.
- Solve single-variable inequalities using symbols.
- Find values of expressions with one variable and up to two operations including basic operations and exponents.
- Write an algebraic expression (with one or two operations) which generalizes a linear pattern.
- Create a corresponding algebraic expression when given an arithmetic operation/relationship expressed in words.
- Evaluate formulas with and without context by solving for a specified variable.

Sub-skill: Properties

Descriptors, such as but not limited to

- Identify a pair of equivalent numerical or one-variable expressions when using commutative or associative properties with addition and multiplication.
- Demonstrate understanding of up to four-step order of operations using parentheses, exponents and fraction symbol.
- Demonstrate understanding of distributive property without variables.
- Solve order of operations problems with one variable to demonstrate understanding of commutativity and associativity.

WKCE-CRT Fall Grade 10 Mathematics Assessment Framework

Objective: Mathematical Processes

Students will effectively use mathematical knowledge, skills and strategies related to reasoning, communication, connections, representation and problem solving.

Descriptors, such as but not limited to

- Use reasoning and logic to perceive patterns, formulate questions, identify relationships, pose problems, make and test conjectures, and evaluate and justify strategies.
- Effectively use the vocabulary of mathematics and communicate mathematical ideas and logical arguments in a variety of ways e.g., using words, numbers, symbols, charts, tables, diagrams, graphs, and models.
- Connect mathematics to the real world, as well as within mathematics.
- Create and use representations to organize, record, and communicate mathematical ideas.
- Solve and analyze routine and non-routine problems.

Objective: Number Operations and Relationships**Sub-skill: Concepts****Descriptors, such as but not limited to**

- Apply proportional reasoning and ratios in mathematical and real-world contexts.
- Analyze and solve problems using percents and proportions.
- Evaluate strategies, test reasonableness of results and create and evaluate numerical arguments presented in mathematical and real-world contexts.

Sub-skill: Computation**Descriptors, such as but not limited to**

- Select and use appropriate properties, computational procedures, and modes of representation with and without context e.g., simple and compound interest, commission, percents, proportions.
- Compare, perform and explain operations on real numbers with and without context e.g., transitivity, rate of change, exponential functions, scientific notation, roots, powers, reciprocals, absolute value, ratios, proportions, percents, rate of change.

Objective: Geometry**Sub-skill: Describing figures****Descriptors, such as but not limited to**

- Identify, describe and analyze properties of figures, relationships among figures and relationships among their parts e.g., parallel, perpendicular and congruent sides, various types of angles and triangles, complementary and supplementary angles, sum of angles in a triangle.
- Present convincing geometric arguments by means of informal proof, counter-examples or other logical means.
- Model problems using the Pythagorean Theorem and right triangle trigonometry.

Sub-skill: Spatial relationships and transformations**Descriptors, such as but not limited to**

- Use proportional reasoning to solve congruence and similarity problems e.g., scale drawings and similar geometric figures
- Visualize shapes and figures in problem-solving situations.
- Use transformations and symmetry to solve problems.

Sub-skill: Coordinate systems

Descriptors, such as but not limited to

- Use the two-dimensional rectangular coordinate system to describe and characterize properties of geometric figures.
- Identify and apply symmetry about an axis.
- Use the two-dimensional rectangular coordinate system and algebraic procedures to describe and characterize geometric properties and relationships e.g., slope, intercepts, parallelism, and perpendicularity.

Objective: Measurement

Sub-skill: Measurable attributes

Descriptors, such as but not limited to

- Identify, describe and use derived attributes to represent and solve problems e.g., speed, acceleration, density, money conversion.

Sub-skill: Direct measurement

Descriptors, such as but not limited to

- Use appropriate tools to accurately determine direct and indirect measurements e.g., length, angles, elapsed time.

Sub-skill: Indirect measurement

Descriptors, such as but not limited to

- Use right-triangle trig functions and the Pythagorean Theorem to solve right-triangle problems.
- Determine the perimeter/area of two-dimensional figures and the surface area/volume of three-dimensional figures.
- Solve for angles, arcs and segments in polygons and circles.
- Use formulas in applications e.g., distance, acceleration, interest.

Objective: Statistics and Probability

Sub-skill: Data analysis and statistics

Descriptors, such as but not limited to

- Organize, display, compare and interpret data in a variety of ways in mathematical and real-world contexts e.g., histograms, line graphs, stem-and-leaf plots, scatter plots, box-and whiskers, bar charts, Venn diagrams, tables, circle graphs.
- Interpret, analyze and make predictions from organized and displayed data. e.g., measures of central tendency, measures of variation such as standard deviation, mean, median, mode, range, dispersion, outliers, line of best fit, percentiles.
- Analyze, evaluate and critique methods and conclusions of statistical experiments e.g., randomness, sampling, techniques, surveys.

Sub-skill: Probability

Descriptors, such as but not limited to

- Determine the likelihood of occurrence of simple and complex events e.g., combinations and permutations, fundamental counting principle, experimental versus theoretical probability and independent, dependent and conditional probability.

Objective: Algebraic Relationships

Sub-skill: Patterns, relations and functions

Descriptors, such as but not limited to

- Describe, recognize, interpret and translate graphical representations of mathematical and real-world phenomena on coordinate grids, e.g., slope, intercepts, rate of change, linear and non-linear functions, and quadratic, exponential and constant functions.
- Analyze, generalize and represent patterns of change, e.g., direct and inverse variations, including numerical sequences, patterns to a given term, algebraic expressions and equations.

Sub-skill: Expressions, equations and inequalities

Descriptors, such as but not limited to

- Solve linear and quadratic equations, linear inequalities and systems of linear equations and inequalities.
- Model and solve a variety of mathematical and real-world problems by using algebraic expressions, equations and inequalities, e.g., linear, exponential, quadratic.
- Translate between different representations and describe the relationship among variable quantities in a problem, e.g., tables, graphs, functional notations, formulas.

Sub-skill: Properties

Descriptors, such as but not limited to

- Demonstrate understanding of properties by evaluating and simplifying expressions.
- Demonstrate understanding of properties by solving linear and quadratic equations, linear inequalities, and systems of linear equations and inequalities with one or two variables.