Note:

Non-Negotiable Learning Targets and descriptors are identified with an “*”. The specifications aligned to these targets are assessment descriptors from the Wisconsin Assessment Framework. Non-negotiable indicates targets and descriptors that need to be addressed before the WKCE-CRT. Learning Targets and specifications without an “*” are based on the 12th grade Wisconsin Model Academic Standards for Mathematics and need to be addressed within the algebra and geometry courses (or their equivalents). The specifications for these targets are also part of the Wisconsin Model Academic Standards.

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**Mathematical Processes**

*1.0 Communicate mathematical ideas and reasoning using the vocabulary of mathematics in a variety of ways, e.g., using words, numbers, symbols, pictures, charts, tables, diagrams, graphs and models.*

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<tr>
<th>10th Grade Descriptors (Pre-WKCE)</th>
<th>End of 12th Grade</th>
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<tbody>
<tr>
<td>A.1* Use reasoning and logic to perceive patterns, formulate questions, identify relationships, pose problems, make and test conjectures, and evaluate and justify strategies.</td>
<td>A.12.1 Use reason and logic to evaluate information, perceive patterns, identify relationships, formulate questions, pose problems, and make and test conjectures and pursue ideas that lead to further understanding and deeper insight.</td>
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<td>A.2* 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.</td>
<td>A.12.2 Communicate logical arguments and clearly show why a result does or does not make sense, why the reasoning is or is not valid, and clearly show an understanding of the difference between examples that support a conjecture and a proof of the conjecture.</td>
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<td>A.3* Connect mathematics to the real world, as well as within mathematics.</td>
<td>A.12.3 Analyze non-routine problems and arrive at solutions by various means, including models and simulations, often starting with provisional conjectures and progressing, directly or indirectly, to a solution, justification, or counter-example.</td>
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<tr>
<td>A.4* Create and use representations to organize, record, and communicate mathematical ideas.</td>
<td>A.12.4 Develop effective oral and written presentations employing correct mathematical terminology, notation, symbols and conventions for mathematical arguments and display of data.</td>
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<td>A.5* Solve and analyze routine and non-routine problems.</td>
<td>A.12.5 Organize work and present mathematical procedures and results clearly, systemically, succinctly, and correctly.</td>
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<td>A.12.6 Read and understand mathematical texts and other instructional materials, and writing about mathematics (e.g., articles in journals) and mathematical ideas as they are used in other contexts.</td>
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**What does this mean?**

Students will be given real-life problems in addition to drill and practice problems and will be required to organize, analyze and interpret these problems. They will also be required to explain their answers verbally and in written format.
Content and Process Targets

*2.0 Use a variety of mathematical and technological tools to determine measurements directly (ruler, protractor, compass) and to check reasonableness of answers. When students apply technology, e.g. computers and graphing calculators, they will interpret results appropriately.

   B.6* Determine reasonableness of answers.

   D.2* Select and use tools with appropriate degree of precision to determine measurements directly.

What does this mean? Students will be required to use various tools and/or technology to measure a variety of objects accurately and to determine if their answer is reasonable.

*3.0 Use data in a variety of formats to summarize, predict, and analyze real-world applications.

   E.1* 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.

   E.2* 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.

   E. 3* Analyze, evaluate and critique methods and conclusions of statistical experiments, e.g. randomness, sampling techniques, surveys.

What does this mean? Students will be required to organize, display, compare, interpret and make predictions from a set of real-world data.
Use a variety of counting methods to identify all possible occurrences of events and apply this information to analyze, critique, and predict the results of statistical experiments.

E.3* Analyze, evaluate and critique methods and conclusions of statistical experiments, e.g., randomness, sampling, techniques, surveys.

E.4* 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.

What does this mean? Students will be required to determine and explain the likelihood of occurrence of simple and complex events; students will also analyze the methods and results of statistical experiments.

Compare, perform, explain and evaluate mathematical operations (+, -, *, /, exponents, roots) and properties on real numbers, emphasizing negative and positive numbers; ratios, proportions and percents; and exponents and roots in mathematical and real-world applications.

B.1* Compare and order real numbers.

B.2* Analyze and solve problems using percents.

B.3* Apply proportional reasoning and ratios in mathematical and real-world contexts.

B.4* 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.

B.5* Select and use appropriate properties, computational procedures, and modes of representation with and without context, e.g., simple and compound interest, commission, percents, proportions.

F.6* Demonstrate understanding of properties by evaluating and simplifying expressions.

What does this mean? Students will be required to solve real-world applications involving whole numbers, fractions, decimals, negative numbers, powers, roots and variables.
### *6.0 Identify, describe, and use formulas to solve real-world measurement problems such as interest, perimeter, area, and volume.

- **B.5** Select and use appropriate properties, computational procedures, and modes of representation with and without context, e.g., simple and compound interest, commission, percents, proportions.
- **D.3** Determine the perimeter/area of two-dimensional figures.
- **D.4** Determine the surface area/volume of three-dimensional figures.
- **D.7** Use formulas in applications, e.g., distance formula, simple and compound interest.

**What does this mean?** Students will be required to select and use a variety of measurement formulas to solve real-world applications.

### *7.0 Create and use tables, graphs, equations and formulas to describe relationships between variables.

- **F.1** 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.
- **F.2** 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.
- **F.5** Translate between different representations and describe the relationship among variable quantities in a problem, e.g., tables, graphs, functional notations, formulas.

**What does this mean?** Students will be required to translate between different representations of a relationship.
**8.0** Use the two-dimensional coordinate plane to analyze, generalize and represent algebraic properties in mathematical and real-world applications.

**C.7*** Use the two-dimensional rectangular coordinate system to describe and characterize properties of geometric figures. Identify and apply symmetry about an axis.

**C.8*** 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, Pythagorean Theorem, distance formula.

**F.1*** 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.

**F.2*** 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.

**What does this mean?** Students will be expected to use the 2-dimensional coordinate system to translate between algebraic and geometric information.

**9.0** Model and solve mathematical and real-world applications that can be represented by linear equations and systems of equations, linear inequalities, and quadratic equations.

**F.3*** Solve linear and quadratic equations, linear inequalities and systems of linear equations and inequalities.

**F.4*** Model and solve a variety of mathematical and real-world problems by using algebraic expressions, equations, and inequalities, e.g., linear, exponential, quadratic.

**F.7*** Demonstrate understanding of properties by solving linear and quadratic equations, linear inequalities, and systems of linear equations and inequalities with one or two variables.

**What does this mean?** Students will be required to model and solve a variety of real-world applications and mathematical problems.
*10.0 Evaluate information, analyze patterns, identify relationships, and represent them using algebraic expressions, functions, and equations, e.g., linear, exponential and quadratic, recognizing that a family of functions can model a variety of real-world applications.

F.2* Analyze, generalize and represent patterns of change, e.g., direct and inverse variation, including numerical sequences, patterns to a given term, algebraic expressions and equations.

F.4* Model and solve a variety of mathematical and real-world problems by using algebraic expressions, equations, and inequalities, e.g., linear, exponential, quadratic.

What does this mean? Students will be required to recognize and construct the appropriate algebraic model (linear, quadratic, and exponential) for a variety of mathematical or real-world applications.

*11.0 Explain and use the Pythagorean Theorem and right triangle trigonometry as models to solve a variety of right triangle problems in real-world applications.

C.2* Present convincing geometric arguments by means of informal proof, counter-examples or other logical means.

C.3* Model problems using the Pythagorean Theorem and right triangle trigonometry.

C.4* Use proportional reasoning to solve congruence and similarity problems e.g., scale drawings and similar geometric figures.

D.6* Use right triangle trigonometry functions and the Pythagorean Theorem to solve right triangle problems.

What does this mean? Students will be required to use the Pythagorean Theorem and right triangle trigonometry with or without real-world applications.
**12.0 Identify and apply the definitions related to lines and angles in order to use them to solve problems and perform basic geometric constructions.**

| C.1* | Identify, describe and analyze properties of figures, relationships among figures and relationships among their parts. |
| C.2* | Present convincing arguments by means of informal proof, counter-examples or other logical means. |

**What does this mean? Students will be required to perform basic geometric constructions and to know the difference between the various types of lines and angles.**

**13.0 Classify and describe polygons and 3-dimensional figures.**

| C.1* | Identify, describe and analyze properties of figures, relationships among figures and relationships among their parts. |
| C.6* | Visualize 3-dimensional figures in problem-solving situations |
| C.7* | Use the two-dimensional rectangular coordinate system to describe and characterize properties of geometric figures. Identify and apply symmetry about an axis. |
| C.8* | 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, Pythagorean Theorem, distance formula). |

**What does this mean? Students will be able to classify and describe a variety of geometric shapes including both 2 and 3-dimensional figures such as squares, kites, prisms, cones, pyramids.**
### 14.0 Use and analyze geometric relationships and properties of polygons and 3-dimensional figures to solve mathematical and real-world applications.

- **C.12.1** Identify, describe and analyze properties of figures, relationships among figures and relationships among their parts by constructing physical models, drawing precisely with paper-and-pencil, hand calculators, and computer software, using appropriate transformations, and using reason and logic.

- **C.12.2** Use geometric models to solve mathematical and real-world problems.

- **C 12.3** Present convincing arguments by means of demonstration, informal proof, counter-examples or any other logical means to show the truth of statements (e.g. these two triangles are not congruent) and generalizations (e.g., the Pythagorean theorem holds for all right triangles).

- **D.5** Solve for angles and segments in similar polygons and arcs in circles.

**What does this mean?** Students will be required to solve problems using their knowledge of polygons and their properties.

### 15.0 Apply the basic theorems of congruence and similarity to solve mathematical and real-world applications.

- **C.12.1** Identify, describe, and analyze properties of figures, relationships among figures, and relationships among their parts by constructing physical models, drawing precisely with paper-and-pencil, hand calculators, and computer software, using appropriate transformations, and using reason and logic.

- **C 12.3** Present convincing arguments by means of demonstration, informal proof, counter-examples or any other logical means to show the truth of statements (e.g. these two triangles are not congruent) and generalizations (e.g., the Pythagorean theorem holds for all right triangles).

- **C.12.5** Identify and demonstrate an understanding of the three ratios used in right-triangle trigonometry.

- **D.12.3** Determine measurements indirectly, using proportional reasoning.

- **F.12.4** Model and solve a variety of mathematical and real-world problems by using algebraic expressions, equations and inequalities.

**What does this mean?** Students will be required to solve real-world applications involving congruency and similarity.
16.0 Apply transformations and their compositions to analyze geometric figures and create designs.

C.12.1 Identify, describe, and analyze properties of figures, relationships among figures, and relationships among their parts by constructing physical models, drawing precisely with paper-and-pencil, hand calculators, and computer software, using appropriate transformations (e.g., translations, rotations, reflections, enlargements), and using reason and logic.

C.12.2 Use geometric models to solve mathematical and real-world problems.

C.12.4 Use the two-dimensional rectangular coordinate system and algebraic procedures to describe and characterize geometric properties and relationships such as slope, intercepts, parallelism, and perpendicularity.

C.5* Use transformations and symmetry to solve problems.

What does this mean? Students will be required to use transformations (reflection, rotation, translation and enlargement) to create geometric designs (tessellations).

17.0 Use properties of circles to solve mathematical and real-world applications.

C.12.1 Identify, describe and analyze properties of figures, relationships among figures and relationships among their parts.

C.12.2 Use geometric models to solve mathematical and real-world problems.

D.12.3 Determine measurements indirectly using geometric relationships and properties of circles and polygons (e.g., size of central angles, area of a sector of a circle).

What does this mean? Students will be required to solve problems using the properties of circles such as arcs, central angles and sectors.
18.0 Use perimeter, area, volume and surface area to solve real-world applications.

C.12.1 Identify, describe and analyze properties of figures, relationships among figures and relationships among their parts by constructing physical models and drawing precisely with paper and pencil, hand calculators, and computer software.

C.12.2 Use geometric models to solve mathematical and real-world problems.

D.12.3 Determine measurements indirectly, using geometric formulas to derive lengths, areas, or volumes of shapes and objects.

What does this mean? Students will be required to solve real-world applications using perimeter, area, volume and surface area.

19.0 Use increased rigor in justifying conclusions to mathematical and real-world applications and in verifying the truth of geometric theorems.

A.12.1 Use reason and logic to evaluate information, perceive patterns, identify relationships, formulate questions, pose problems, and make and test conjectures.

B.12.5 Create and critically evaluate numerical arguments presented in a variety of classroom and real-world situations (e.g., political, economic, scientific, social).

C.12.3 Present convincing arguments by means of demonstration, informal proof, counter examples or any other logical means to show the truth of statements and generalizations.

What does this mean? Students will understand that very different arguments can be used to justify conclusions and verify truth.