



Standards By Design:

CIM (High School) for Mathematics



Acknowledgment

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Message to Students

Dear Student,

The world is changing quickly. For you to succeed in school, at work, and in the community, you will need more skills and knowledge than ever before. These days, “ready for college” and “ready for work” essentially mean the same thing: “ready for life.”

Getting in shape academically is one of the most important things you can do to prepare for a successful future. Your future starts with Oregon’s academic standards. This booklet explains what you should know and be able to do in each subject, at your grade level.

Please review this guide with your teachers and share it with your parents and family. To be ready for tomorrow, get in top academic shape today. You can use this guide year round to check your progress.



Message to Parents

Dear Parent,

Education is the building block of every student's future. To ensure all students have the opportunity to succeed, Oregon has adopted world-class academic standards in English/language arts, mathematics, science, social studies, the arts, health education, physical education and second languages. The academic content standards clearly outline what students should know and be able to do in each subject, at each grade level. Oregon's teachers are dedicated to helping all students meet these expectations.

Moreover, these standards are the cornerstone of the state's plan for improving student achievement. They provide a comprehensive blueprint for what we must do to support students every step of the way – from their earliest years through post-high school education. To be competitive in today's economy and to earn enough to support a family, all students need to continue their education beyond high school, whether at a two- or four-year college, in an apprenticeship program, or in the military.

How can you help your student meet these challenges? Learning occurs many places, not only in the classroom. Students spend far more time at home than they do in school. How they spend their time can make a real difference. Nothing will have a bigger impact on your student's success than your involvement in his or her education.

On the next page is a list of 12 things you can do to help ensure your child has the best education possible – from preschool to post-high school opportunities. We hope you will use this guide as a tool to help your child succeed today and in the future.

Sincerely,

A handwritten signature in black ink that reads "Susan Castillo". The signature is fluid and cursive, with the first name "Susan" and last name "Castillo" clearly legible.

Susan Castillo
Superintendent of Public Instruction

Twelve things parents can do to help students succeed

- 1. Promote education beyond high school.** Make sure your child knows you expect him or her to continue learning after high school – it's never too early to start raising these expectations. To keep our families, communities, and economy strong, all students need to keep learning.
- 2. Build relationships with your child's teachers.** Find out what each teacher expects of your child. Learn how you can help your child prepare to meet these expectations.
- 3. Read to your child.** Reading is the foundation for all learning and is one of the most important contributions you can make to your child's education. Read to your young child, encourage your older child to read to you, or spend time together as a family reading. All this helps your child develop strong reading habits and skills from the beginning and reinforces these habits and skills as your child grows.
- 4. Practice writing at home.** Letters, journal entries, e-mail messages, and grocery lists are all writing opportunities. Show that writing is an effective form of communication and that you write for a variety of purposes.
- 5. Make math part of everyday life.** Paying bills, cooking, gardening, and even playing games are all good ways to help your child understand and use mathematics skills. Show that there may be many ways to get to the right answer and encourage your child to explain his or her method.
- 6. Ask your child to explain his or her thinking.** Ask lots of "why" questions. Children should be able to explain their reasoning, how they came up with their answer, and why they chose one answer over another.
- 7. Expect that homework will be done.** Keep track of your child's homework assignments and regularly look at his or her completed work. Some teachers give parents a number to call for a recorded message of that day's homework; others put the assignments on the Internet. If your school doesn't offer these features, talk to the teacher about how you can get this important information. Even if there aren't specific assignments, stay informed about what your child is working on so that you can help at home.
- 8. Use the community as a classroom.** Feed your child's curiosity about the world 365 days a year. Use the library to learn more about the history of your town. A visit to a farmer's market can help your child picture our state's rich agricultural tradition. Take your young child to zoos and parks and your older child to museums and workplaces to show how learning connects to the real world.
- 9. Encourage group study.** Open your home to your child's friends for informal study sessions. Promote outside formal study groups through church, school organizations, or other groups. Study groups will be especially important as your child becomes older and more independent. The study habits your child learns now will carry over into college and beyond.
- 10. Spend time at school.** The best way to know what goes on in your child's school is to spend time there. If you're a working parent, this isn't easy, and you may not be able to do it very often. Even so, "once in awhile" is better than "never."
- 11. Start a college savings plan as soon as possible.** Investigate Oregon's College Savings Plan and other investment vehicles and contribute as much as you can.

12. Promote high standards for all. To ensure the academic success of our children, everyone must work toward the same goal. Discuss academic expectations with parents and other people in your community. Use your school and employee newsletters, athletic associations, booster clubs, a PTA or PTO meeting, or just a casual conversation to explain why academic standards are important and what they mean to you and your family. Share your tips for helping your own son or daughter succeed in school and encourage others to share their suggestions as well.

Remember: You are the most important influence on your child. Oregon's academic standards give you important tools to ensure your child gets the best education possible and is well prepared for the future.



Measuring Student Learning

Children develop at different rates. Some take longer and need more help to learn certain skills.

Assessments at the state level provide a measure of school accountability – assisting schools in their efforts to align curriculum and instruction with the state’s academic standards and reporting progress to parents and the public.

Assessments at the classroom level help teachers and parents understand how students are progressing and assist in identifying academic areas where students may need additional attention.

The Oregon Assessment of Knowledge and Skills (OAKS) consists of three broad areas:

1. Multiple Choice Tests present the student with a series of questions or problems. The student responds on an answer sheet and responses are scored by machine. These tests are required in grades 3-8 and high school/CIM for English Language Arts and mathematics and for grades 5, 8, and high school/CIM in science. An optional multiple choice test is also available for Social Sciences in grades 5, 8 and high school/CIM.

2. State Writing Assessments require students to give extended written responses to open-ended topics provided by the state in a supervised testing situation. Trained raters at state-run scoring sites judge student work using the state scoring guide. These performance assessments are required for grades 4, 7 and high school/CIM.

3. Classroom Work Samples are a series of formal classroom assessments available to Oregon teachers in grades 3 to high school/CIM that allow students to respond to locally provided topics or complex problems. Student work is rated by teachers in their own schools or districts using state scoring guides. Work samples are collected in Writing, Speaking, Mathematics Problem Solving, Scientific Inquiry and Social Science Analysis.

Who is required to take state assessments?

Third grade is the first time that many students will be taking a statewide assessment. Third grade students take tests in Reading/Literature and Mathematics that are delivered through TESA (Technology Enhanced State Assessment) a computerized adaptive testing system.

The table below lists the statewide assessment schedule, by grade.

Required Statewide Testing

	3	4	5	6	7	8	10/CIM
Reading/Literature	X	X	X	X	X	X	X
Writing		X			X		X
Mathematics	X	X	X	X	X	X	X
Science			X			X	X
Social Sciences (optional)			X			X	X

How is student performance measured on these assessments?

Content Standards describe what students in Oregon should learn. How well they learn the content is determined by Achievement Standards. These Achievement Standards, or “cut scores”, identify the score needed to demonstrate solid understanding of the Content Standards. The following table shows the current Achievement Standards in Reading/Literature and Mathematics for grades 3-8 and 10/CIM.

Grade	<u>Reading/Literature</u>		<u>Mathematics</u>		<u>Science</u>	
	Meet	Exceed	Meet	Exceed	Meet	Exceed
3	204	218	205	217	----	----
4	211	223	212	225	----	----
5	218	230	218	229	225	238
6	222	234	221	232	----	----
7	227	239	226	238	----	----
8	231	241	230	241	234	246
10/CIM	236	248	236	246	239	249

The state writing assessment and classroom work samples are scored using state scoring guides. As an assessment tool, scoring guides provide specific criteria to describe a range of possible student responses and a consistent set of guidelines to rate student work. For the state writing assessment, student work is scored by two different raters and their scores combined to create a “composite score.”

Since the scoring guide serves as the primary assessment tool to determine whether students have met the standards through a collection of work samples, teachers are asked to align their classroom assessments carefully to the criteria described on the scoring guide. **Composite scores are not required for classroom work samples.**

For more information on assessments, please visit <http://www.ode.state.or.us/search/results/?id=169>

Mathematics

CIM

High School mathematics students become fluent with real number computations. They recognize, graph and find formulas for linear, quadratic, and exponential relationships and functions, and use these to model real-world situations. They increase their understanding of mathematical reasoning by creating conjectures and by justifying and critiquing geometric arguments involving triangles, rectangles and circles. In statistics, they compute simple and compound probabilities and also analyze data to make inferences and predictions. Students also are introduced to the normal distribution.

Calculations and Estimations

CCG: Numbers :
Understand numbers, ways of representing numbers, relationships among numbers, and number systems.

CIM (High School)

MA.CM.CE.01

Compare real numbers.

MA.CM.CE.02

Order and compare numbers expressed in scientific notation to each other and to other forms of real numbers.

MA.CM.CE.03

Recognize that the set of real numbers contains the set of irrational numbers and the set of rational numbers and know the difference between them.

MA.CM.CE.04

Locate real numbers on a number line (including approximations of irrational numbers).

MA.CM.CE.05

Apply equivalent forms of real numbers to solve problems.

CCG: Computation and Estimation :
Compute fluently and make reasonable estimates.

CIM (High School)

MA.CM.CE.06

Compute with real numbers, including absolute value and numbers expressed in scientific notation.

MA.CM.CE.07

Compute with integer exponents and whole number roots.

MA.CM.CE.08

Mentally multiply and divide by powers of 10 to estimate results of computations involving numbers expressed in scientific notation.

MA.CM.CE.09

Develop and use strategies to estimate the results of real number computations, determine the amount of error, and judge the reasonableness of results. (Some of the skills and concepts in the preceding standard are assessed at the classroom level and others at the state level. See the Oregon Standards Newspaper for specifics.)

MA.CM.CE.10

Estimate the results of computations with integer powers and roots of real numbers.

Material in *Italics* is eligible for statewide assessment. **Bold** text is for supporting classroom instruction and assessment.

CCG: Operations and Properties :
Understand meanings of operations and how they relate to one another.

CIM (High School)

MA.CM.CE.11

Recognize that taking the n th root of a number corresponds to prime factorization.

MA.CM.CE.12

Use the inverse operations of n th power and n th root to solve problems and check solutions. (Some of the skills and concepts in the preceding standard are assessed at the classroom level and others at the state level. See the Oregon Standards Newspaper for specifics.)

MA.CM.CE.13

Apply the associative, commutative, and distributive properties to simplify computations with real numbers.

MA.CM.CE.14

Use properties of numbers to demonstrate whether assertions are true or false.

Statistics and Probability

CCG: Statistics :
Select and use appropriate statistical methods to analyze data.

CIM (High School)

MA.CM.SP.01

Estimate from a graph or a set of data the mean and standard deviation of a normal distribution and draw conclusions about the distribution of data using measures of center and spread (e.g., analyze a variety of summary statistics and graphical displays). (Some of the skills and concepts in the preceding standard are assessed at the classroom level and others at the state level. See the Oregon Standards Newspaper for specifics.)

MA.CM.SP.02

Analyze bivariate data and identify the type of function (e.g., linear, quadratic, exponential) that could be used to model the data.

CCG: Probability :
Understand and apply basic concepts of probability.

CIM (High School)

MA.CM.SP.03

Compute the probability of a compound event (e.g., toss a coin three times to find the probability of two heads).

MA.CM.SP.04

Determine probabilities of dependent and independent events (e.g., use colored marbles with and without replacement).

MA.CM.SP.05

Use conditional probability to solve problems (e.g., from a sample set for the roll of two tetrahedral die; given that a sum is even, what is the probability that the sum is 6?).

MA.CM.SP.06

Determine all possible

outcomes of a particular event or all possible arrangements of objects in a given set by applying counting strategies, combinations, and permutations. (Some of the skills and concepts in the preceding standard are assessed at the classroom level and others at the state level. See the Oregon Standards Newspaper for specifics.)

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CCG: Collect and Display Data :
Formulate questions that can be addressed with data and collect, organize, and display relevant data to answer them.

CIM (High School)

MA.CM.SP.07

Determine appropriate designs for simulations (surveys, observational studies, and experiments) and modeling to study a problem and construct empirical probability distributions to represent results. (Some of the skills and concepts in the preceding standard are assessed at the classroom level and others at the state level. See the Oregon Standards Newspaper for specifics.)

MA.CM.SP.08

Use matrices, histograms, scatter plots, stem-and-leaf plots, and box-and whisker-plots to interpret data.

MA.CM.SP.09

Identify examples of populations that are normally distributed.

CCG: Data Analysis and Predictions :
Develop and evaluate inferences and predictions that are based on data.

CIM (High School)

MA.CM.SP.10

Make inferences and predictions from data in histograms, scatter plots, and parallel box plots.

MA.CM.SP.11

Make predictions about populations based on reported sample statistics.

MA.CM.SP.12

Understand that inferences about a population drawn from a sample involve uncertainty and that the role of statistics is to measure that uncertainty.

Algebraic Relationships

CCG: Patterns and Functions :
Understand patterns, relations, and functions.

CIM (High School)

MA.CM.AR.01

Represent and generalize sequences resulting from linear, quadratic, and exponential relationships using recursive or explicit formulas tables of values and graphs. (Some of the skills and concepts in the preceding standard are assessed at the classroom level and others at the state level. See the Oregon Standards Newspaper for specifics.)

MA.CM.AR.02

Produce a valid conjecture using inductive reasoning by generalizing from a pattern of observations.

MA.CM.AR.03

Evaluate and make a table for two-variable formulas and match a graph or table of values to its formula.

MA.CM.AR.04

Identify independent and dependent variables and determine the domain and range of a function in a problem situation.

CCG: Algebraic Relationships :
Represent and analyze mathematical situations and structures using algebraic symbols.

Material in *Italics* is eligible for statewide assessment. **Bold** text is for supporting classroom instruction and assessment.

CIM (High School)

MA.CM.AR.05

Algebraically represent situations and solve problems involving quadratic and exponential equations, including exponential growth and decay.

MA.CM.AR.06

Use graphs to solve non-linear equations, including quadratics.

MA.CM.AR.07

Represent and solve system of linear equations with two variables using simultaneous equations and by graphing.

MA.CM.AR.08

Recognize and generate equivalent forms for algebraic expressions, including combining like terms and expanding binomials. (Some of the skills and concepts in the preceding standard are assessed at the classroom level and others at the state level. See the Oregon Standards Newspaper for specifics.)

MA.CM.AR.09

Evaluate algebraic expressions and formulas by substituting real numbers.

MA.CM.AR.10

Translate between and interpret quadratic and exponential relationships represented by words, symbols, tables, and graphs.

MA.CM.AR.11

Determine and interpret maxima or minima and zeros of quadratic functions, and linear functions where $y = \text{constant}$.

MA.CM.AR.12

Graph linear inequalities in two variables.

MA.CM.AR.13

Graph quadratic and exponential equations.

MA.CM.AR.14

Analyze how changing a parameter (i.e., k , b) in a quadratic or exponential function of the form $y=k^ax+b$, $y=kx^2+b$, or $y=k(x+b)^2$ affects its graph.

CCG: Modeling :

Use mathematical models to represent and understand quantitative relationships.

CIM (High School)

MA.CM.AR.15

Model situations, make predictions and inferences, and solve problems using linear, quadratic, and exponential functions.

MA.CM.AR.16

Determine when data represented in a table or graph represents a linear, quadratic, or exponential relationship.

CCG: Change :

Analyze change in various contexts.

CIM (High School)

MA.CM.AR.17

Approximate and interpret rates of change in graphical and numeric data.

MA.CM.AR.18

Analyze the nature of change of each variable in a non-linear relationship as suggested by a table of values, a graph or a formula.

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Measurement

CCG: Units and Tools :
Understand measurable attributes of objects and the units, systems and processes of measurement.

CIM (High School)

MA.CM.ME.01

Determine the appropriate units, scales, and tools for problem situations involving measurement.

MA.CM.ME.02

Solve problems involving unit conversions (e.g., mile per hour to feet per second) given the unit equivalencies.

MA.CM.ME.03

Determine the precision of a given measuring tool (e.g., 1 degree for a standard protractor).

CCG: Direct & Indirect Measurement :
Apply appropriate techniques, tools, and formulas to determine measurements.

CIM (High School)

MA.CM.ME.04

Develop and use strategies and formulas for calculating surface area and volume of cones and spheres. (Some of the skills and concepts in the preceding standard are assessed at the classroom level and others at the state level. See the Oregon Standards Newspaper for specifics.)

MA.CM.ME.05

Use formulas to solve problems involving finding missing dimensions given perimeter, area, surface area and volume of polygons, circles, prisms, pyramids, cones, cylinders, and spheres.

MA.CM.ME.06

Develop, understand, and use the formula for determining arc length (e.g., portion of a circle). (Some of the skills and concepts in the preceding standard are assessed at the classroom level and others at the state level. See the Oregon Standards Newspaper for specifics.)

MA.CM.ME.07

Determine perimeter and area of shapes of circles and polygons (annulus, etc.) in context.

MA.CM.ME.08

Determine the surface area and volume of a complex figure composed of a combinations of two or more geometric figures or a figure derived from a regular solid (e.g., hemisphere, frustum of a cone).

MA.CM.ME.09

Compare and contrast the formulas for surface area and volume of cylinders and cones.

MA.CM.ME.10

Determine a shape that has minimum or maximum perimeter, area, surface area, or volume under specified conditions.

MA.CM.ME.11

Make and use scale drawings and models to solve problems. (Some of the skills and concepts in the preceding standard are assessed at the classroom level and others at the state level. See the Oregon Standards Newspaper for specifics.)

Geometry

Material in *Italics* is eligible for statewide assessment. **Bold** text is for supporting classroom instruction and assessment.

CCG: Properties and Relationships :
Analyze characteristics and properties of two- and three-dimensional geometric shapes and develop mathematical arguments about geometric relationships

CIM (High School)

MA.CM.GM.01

Determine defining properties that characterize classes of three-dimensional figures and their component parts.

MA.CM.GM.02

Recognize and represent three-dimensional figures and their component parts.

MA.CM.GM.03

Justify and use theorems involving the angles formed by parallel lines cut by a transversal. (Some of the skills and concepts in the preceding standard are assessed at the classroom level and others at the state level. See the Oregon Standards Newspaper for specifics.)

MA.CM.GM.04

Develop, understand, and apply properties of circles and of inscribed and circumscribed polygons. (Some of the skills and concepts in the preceding standard are assessed at the classroom level and others at the state level. See the Oregon Standards Newspaper for specifics.)

MA.CM.GM.05

Use measures of sides and of interior and exterior angles of polygons to classify figures and solve problems.

MA.CM.GM.06

Prove congruence of two triangles or their corresponding component parts.

MA.CM.GM.07

Determine the measures of corresponding angles, sides, and corresponding part of congruent and similar figures.

MA.CM.GM.08

Use angle, side length and triangle inequality relationships to solve problems.

MA.CM.GM.09

Use trigonometric functions, and angle and side relationships of special right triangles (30- 60-right triangles and isosceles right triangles) to solve for an unknown length and determine distances and solve problems.

MA.CM.GM.10

Investigate relationships among chords, secants, tangents, inscribed angles, and inscribed and circumscribed polygons of circles.

MA.CM.GM.11

Construct and judge the validity of a logical argument and give counterexamples to disprove a statement.

MA.CM.GM.12

Justify and use theorems involving the properties of triangles, quadrilaterals, circles, and their component parts to verify congruence and similarity. (Some of the skills and concepts in the preceding standard are assessed at the classroom level and others at the state level. See the Oregon Standards Newspaper for specifics.)

CCG: Modeling :
Use visualization, spatial reasoning, and geometric modeling to solve problems.

CIM (High School)

MA.CM.GM.13

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Model, sketch, label and where appropriate construct cones and spheres, and basic elements of geometric figures (e.g., altitudes, midpoints, medians, angle bisectors, and perpendicular bisectors) using compass and straightedge or technology.

MA.CM.GM.14

Describe how two or more objects are related in space (e.g., skew lines, the possible ways three planes might intersect).

MA.CM.GM.15

Make a model of a three-dimensional figure from a two-dimensional drawing and make a two-dimensional representation of a three-dimensional object through scale drawings, perspective drawings, blueprints or computer simulations.

MA.CM.GM.16

Recognize representations of three-dimensional objects from different perspectives and identify cross-sections of three-dimensional objects.

CCG: Coordinate Geometry :
Specify locations and describe spatial relationships using coordinate geometry and other representational systems.

CIM (High School)

MA.CM.GM.17

Determine the relative placement (e.g., intersecting, parallel, perpendicular) of two lines on a coordinate plane given the algebraic equations representing them.

MA.CM.GM.18

Calculate slope, distance and midpoint between points with an emphasis on practical applications (use coordinate formulas). (Some of the skills and concepts in the preceding standard are assessed at the classroom level and others at the state level. See the Oregon Standards Newspaper for specifics.)

CCG: Transformations and Symmetry :
Apply transformations and use symmetry to analyze mathematical situations.

CIM (High School)

MA.CM.GM.19

Use coordinate geometry to determine whether a figure is symmetrical with respect to a line or a point.

MA.CM.GM.20

Determine whether a given pair of figures on a coordinate plane represent a translation, reflection, rotation and/or dilation.

MA.CM.GM.21

Determine the image of a figure on a coordinate graph under translations, reflections, and rotations.

MA.CM.GM.22

Given a figure and its image on a coordinate graph, determine the translation vector or locate the axis of reflection.

MA.CM.GM.23

Determine the coordinates of and draw the dilation of a figure on a coordinate graph. (Some of the skills and concepts in the preceding standard are assessed at the classroom level and others at the state level. See the Oregon Standards Newspaper for specifics.)

MA.CM.GM.24

Analyze the congruence, similarity, and line or rotational symmetry of figures using transformations.

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Mathematical Problem Solving

CCG: Conceptual Understanding :
Select, apply, and translate among mathematical representations to solve problems.

CIM (High School)

MA.CM.PS.01

Interpret the concepts of a problem-solving task and translate them into mathematics.

CCG: Processes and Strategies :
Apply and adapt a variety of appropriate strategies to solve problems.

CIM (High School)

MA.CM.PS.02

Choose strategies that can work and then carry out the strategies chosen.

CCG: Verification :
Monitor and reflect on the process of mathematical problem solving.

CIM (High School)

MA.CM.PS.03

Produce identifiable evidence of a second look at the concepts/strategies/calculations to defend a solution.

CCG: Communication :
Communicate mathematical thinking coherently and clearly. Use the language of mathematics to express mathematical ideas precisely.

CIM (High School)

MA.CM.PS.04

Use pictures, symbols, and/or vocabulary to convey the path to the identified solution.

CCG: Accuracy :
Accurately solve problems that arise in mathematics and other contexts.

CIM (High School)

MA.CM.PS.05

Accurately solve problems using mathematics.