Massachusetts Curriculum Frameworks | MATHEMATICS | MA2

WHAT TO LOOK FOR

A quick guide for evaluating classroom content and practice

In **Model Algebra II**, instructional time should focus on four critical areas:

1. Relating arithmetic and structure of rational expressions to arithmetic and structure of rational numbers (A)

2. Expanding understandings of functions and graphing to include modeling trigonometric functions (F)

3. Synthesizing and generalizing functions and extending understanding/problem solving of exponential functions to logarithmic functions (F)

4. Relating data display and summary statistics to probability and exploring a variety of data collection methods and designs (S)

In a **Model Algebra II** math class, you should observe students engaged with at least one mathematics content and practice standard:

Mathematical Practices

- Making sense of problems and persevering in solving them
- Reasoning abstractly and quantitatively
- Constructing viable arguments and critiquing the reasoning of others
- Modeling with mathematics
- Using appropriate tools strategically
- Attending to precision
- Looking for and making use of structure
- Looking for and expressing regularity in repeated reasoning

Content Standards

Number and Quantity (N-CN, N-VM)

- Performing arithmetic operations with complex numbers (*imaginary numbers*)
- Using complex numbers in polynomial identities and equations
- Representing and modeling with vector quantities (*magnitude, direction, velocity*) (+)
- Performing operations on matrices and using matrices in applications (represent and manipulate data) (+)

Algebra (A-SSE, A-APR, A-CED, A-REI)

- Interpreting the structure of expressions *(exponential, polynomial, rational)* and writing expressions in equivalent forms to solve problems «
- Performing arithmetic operations on polynomials
- Understanding the relationship between zeros and factors of polynomials
- Using polynomial identities to solve problems
- Rewriting simple rational expressions in different forms
- Creating equations and inequalities that describe numbers or relationships «
- Representing constraints by equations or inequalities (including systems) and interpreting solutions as viable or non-viable options «
- Explaining the process of reasoning when solving rational and radical equations
- Representing and solving equations and inequalities graphically *(polynomial, rational, logarithmic)* «

Functions (F-IF, F-BF, and F-LE)

- Recognizing and interpreting functions *(polynomial, rational, square root and cube root, trigonometric, logarithmic)* that arise in applications in terms of the context *(increasing/decreasing, max/minimum, symmetry, end behavior, periodicity, domain, rate of change)* «
- Analyzing functions using different representations *(algebraically, graphically, tables, verbal description)* and translate between them «
- Building a function *(simple rational, radical, logarithmic, trigonometric, and including inverse functions)* that models a relationship between two quantities or building new functions from existing functions
- Constructing and comparing linear, quadratic, and exponential models to solve problems «
- Using the *unit circle* to understand the domain of trigonometric functions as they relate to *real numbers*
- Modeling periodic phenomena *(amplitude, frequency, midline)* with trigonometric functions «
- Proving the Pythagorean identity and using it to find other trigonometric measurements *(sin(ϑ), cos(ϑ), or tan(ϑ))*

Statistics and Probability (S-ID)

- Summarizing, representing, and interpreting data on a single count or measurement variable *(mean, standard deviation, normal curve)* «
- Recognizing the purposes of and differences among sample surveys, experiments and observational studies and explaining how randomization relates to each «
- Deciding if a specified model *(simulation)* is consistent with results
- Understanding and evaluating random processes that underlie statistical experiments *(margin of error, significance)* «
- Making inferences and justify conclusions from sample surveys, experiments, and observational studies
- Analyzing decision and strategies using probability concepts (+)«

NOTES

(**«**) designates a modeling standard
(+) Designates standards that go beyond course level

Mathematics What to Look For The example below features three Indicators from the Standards of Effective Practice. These Indicators are just a sampling from the full set of Standards and were chosen because they create a sequence: the educator plans a lesson that sets clear and high **expectations**, the educator then delivers high quality **instruction**, and finally the educator uses a variety of **assessments** to see if students understand the material or if re-teaching is necessary. This example highlights teacher and student behaviors aligned to the three Indicators that you can expect to see in a rigorous Model Algebra 1 math classroom.

Expectations (Standard II, Indicator E)

Plans and implements lessons that set clear and high expectations and also make knowledge accessible for all students.

What is the teacher doing?

- Communicating a lesson's objectives and their connections to unit essential questions and goals.
- Creating culturally responsive lessons that engage and sustain student attention
- Establishing classroom routines that require students to defend their thinking using a logical progression
- Demonstrating the development of sophisticated mathematical models (e.g., flow charts, formulas)

What are the students doing?

- Applying mathematical strategies and concepts when engaging with meaningful real-world problems
- Using mathematical language precisely to convey meaning and understanding of concepts
- Justifying a solution method using a logical progression of arguments and critiquing the reasoning of others
- Using sophisticated mathematical models (e.g. computer models)

Instruction (Standard II, Indicator A)

Uses instructional practices that reflect high expectations regarding content and quality of effort and work; engage all students; and are personalized to accommodate diverse learning styles, needs, interests, and levels of readiness.

What is the teacher doing?

- Modeling incorporating others into discussions
- Encouraging students to interpret structures and formulate conjectures about mathematical situations
- Provide students with opportunities to evaluate different approaches to a problem from different perspectives and/or for efficiency

What are the students doing?

- Referencing mathematical elements in context while logically providing claims and counter-claims
- Negotiating with others in response to new ideas, preferences, or contributions
- Actively incorporating others into discussions about mathematical ideas

Assessment (Standard I, Indicator B)

Uses a variety of informal and formal methods of assessments to measure student learning, growth, and understanding to develop differentiated and enhanced learning experiences and improve future instruction.

What is the teacher doing?

- Conducting frequent checks for student understanding and adjusting instruction accordingly
- Prompting students to explain their reasoning and listening to their responses to identify misconceptions
- Providing exemplars that convey mathematical reasoning and understanding (both teacher and student generated)

What are the students doing?

- Purposefully incorporating feedback from teacher and peers into actions
- Demonstrating learning in multiple ways (e.g., mid-unit assessment, group work)
- Engaging in challenging learning tasks regardless of learning needs (e.g., linguistic background, disability, academic gifts)