

# CC - Common Core State Standards

{MA.9-12.} A model can be very simple, such as writing total cost as a product of unit price and number bought, or using a geometric shape to describe a physical object like a coin. Even such simple models involve

making choices. It is up to us whether to model a coin as a three-dimensional cylinder, or whether a two-dimensional disk works well enough for our purposes. Other situations-modeling a delivery route, a production

schedule, or a comparison of loan amortizations-need more elaborate models that use other tools from the mathematical sciences. Real-world situations are not organized and labeled for analysis; formulating tractable

models, representing such models, and analyzing them is appropriately a creative process.

Like every such process, this depends on acquired expertise as well as creativity.

{MA.9-12.} Analytic modeling seeks to explain data on the basis of deeper theoretical ideas, albeit with parameters that are empirically based; for example, exponential growth of bacterial colonies (until cut-off

mechanisms such as pollution or starvation intervene) follows from a constant reproduction rate. Functions are an important tool for analyzing such problems.

{MA.9-12.} Graphing utilities, spreadsheets, computer algebra systems, and dynamic geometry software are powerful tools that can be used to model purely mathematical phenomena (e.g., the behavior of polynomials)

as well as physical phenomena.

{MA.9-12.HSM} Modeling is best interpreted not as a collection of isolated topics but rather in relation to other standards. Making mathematical models is a Standard for Mathematical Practice, and specific modeling

standards appear throughout the high school standards indicated by a star symbol.

{MA.9-12.} Modeling links classroom mathematics and statistics to everyday life, work, and decision-making. Modeling is the process of choosing and using appropriate mathematics and statistics to analyze empirical

situations, to understand them better, and to improve decisions. Quantities and their relationships in physical, economic, public policy, social, and everyday situations can be modeled using mathematical and statistical

methods. When making mathematical models, technology is valuable for varying assumptions, exploring consequences, and comparing predictions with data.

{MA.9-12.} One of the insights provided by mathematical modeling is that essentially the same mathematical or statistical structure can sometimes model seemingly different situations.

Models can also shed light on the

mathematical structures themselves, for example, as when a model of bacterial growth makes more vivid the explosive growth of the exponential function.

# NJCCCS - New Jersey Core Curriculum Content Standards

{MA.12.4.5 B.3} Analyze and evaluate the mathematical thinking and strategies of others.

{MA.12.4.5 C.4} Apply mathematics in practical situations and in other disciplines.

{MA.12.4.5 B.1.2} Discussion, listening, and questioning

{MA.12.4.5 A.5} Monitor their progress and reflect on the process of their problem solving activity.

{MA.12.4.5 A.2.2} Non-routine problems

{MA.12.4.5 A.2.4} Problems that can be solved in several ways

{MA.12.4.5 A.2.3} Problems with multiple solutions

{MA.12.4.5 B.1.1} Reading and writing

{MA.12.4.5 C.1} Recognize recurring themes across mathematical domains (e.g., patterns in number, algebra, and geometry).

{MA.12.4.5 C.3} Recognize that mathematics is used in a variety of contexts outside of mathematics.

{MA.12.4.5 C.5} Trace the development of mathematical concepts over time and across cultures (cf. world languages and social studies standards).

{MA.12.4.5 C.6} Understand how mathematical ideas interconnect and build on one another to produce a coherent whole.

{MA.12.4.5 C.2} Use connections among mathematical ideas to explain concepts (e.g., two linear equations have a unique solution because the lines they represent intersect at a single point).

{MA.12.4.5 F.1} Use technology to gather, analyze, and communicate mathematical information.

{MA.12.4.5 B.4} Use the language of mathematics to express mathematical ideas precisely.

## Route 21 Standards:

### Learning and Innovation Skills

#### Creativity & Innovation

##### *Think Creatively*

- 1 Use a wide range of idea creation techniques (such as brainstorming)
- 2 Create new and worthwhile ideas (both incremental and radical concepts)
- 3 Elaborate, refine, analyze and evaluate their own ideas in order to improve and maximize creative efforts

##### *Implement Innovations*

- 1 Act on creative ideas to make a tangible and useful contribution to the field in which the innovation will occur

#### Critical Thinking & Problem Solving

##### *Reason Effectively*

- Use various types of reasoning (inductive, deductive, etc.) as appropriate to the situation

##### *Use Systems Thinking*

- Analyze how parts of a whole interact with each other to produce overall outcomes in complex systems

##### *Make Judgments and Decisions*

- Effectively analyze and evaluate evidence, arguments, claims and beliefs
- Analyze and evaluate major alternative points of view
- Synthesize and make connections between information and arguments
- Interpret information and draw conclusions based on the best analysis
- Reflect critically on learning experiences and processes

### ***Solve Problems***

- Solve different kinds of non-familiar problems in both conventional and innovative ways
- Identify and ask significant questions that clarify various points of view and lead to better solutions

## **Communication & Collaboration**

### ***Communicate Clearly***

- Articulate thoughts and ideas effectively using oral, written and nonverbal communication skills in a variety of forms and contexts
- Listen effectively to decipher meaning, including knowledge, values, attitudes and intentions
- Use communication for a range of purposes (e.g. to inform, instruct, motivate and persuade)
- Utilize multiple media and technologies, and know how to judge their effectiveness a priori as well as assess their impact
- Communicate effectively in diverse environments (including multi-lingual)

## **Life & Career Skills**

### **Flexibility & Adaptability Skills**

#### ***Adapt to Change***

- Adapt to varied roles, jobs responsibilities, schedules and contexts

#### ***Be Flexible***

- Incorporate feedback effectively
- Deal positively with praise, setbacks and criticism
- Understand, negotiate and balance diverse views and beliefs to reach workable solutions, particularly in multi-cultural environments

## **Initiative & Self Direction**

### ***Manage Goals and Time***

- Set goals with tangible and intangible success criteria
- Balance tactical (short-term) and strategic (long-term) goals
- Utilize time and manage workload efficiently

### ***Work Independently***

- Monitor, define, prioritize and complete tasks without direct oversight

### ***Be Self-directed Learners***

- Go beyond basic mastery of skills and/or curriculum to explore and expand one's own learning and opportunities to gain expertise
- Demonstrate initiative to advance skill levels towards a professional level
- Demonstrate commitment to learning as a lifelong process
- Reflect critically on past experiences in order to inform future progress

## *Productivity & Accountability*

### ***Manage Projects***

- Set and meet goals, even in the face of obstacles and competing pressure
- Prioritize, plan and manage work to achieve the intended result

### ***Produce Results***

- Demonstrate additional attributes associated with producing high quality products including the abilities to:
  - ▶ Work positively and ethically
  - ▶ Manage time and projects effectively

## **Information, Media and Technology Skills**

### **Information Literacy**

#### ***Access and Evaluate Information***

- Access information efficiently (time) and effectively (sources)
- Evaluate information critically and competently

#### ***Use and Manage Information***

- Use information accurately and creatively for the issue or problem at hand
- Manage the flow of information from a wide variety of sources
- Apply a fundamental understanding of the ethical/legal issues surrounding the access and use of information

### **Media Literacy**

#### ***Create Media Products***

- Understand and utilize the most appropriate media creation tools, characteristics and conventions
- Understand and effectively utilize the most appropriate expressions and interpretations in diverse, multi-cultural environments

### **ICT (Information, Communications & Technology) Literacy**

#### ***Apply Technology Effectively***

- Use technology as a tool to research, organize, evaluate and communicate information
- Use digital technologies (computers, PDAs, media players, GPS, etc.), communication/networking tools and social networks appropriately to access, manage, integrate, evaluate and create information to successfully function in a knowledge economy
- Apply a fundamental understanding of the ethical/legal issues surrounding the access and use of information technologies

## **NETS-S Standards:**

### **1. Creativity and Innovation**

Students demonstrate creative thinking, construct knowledge, and develop innovative products and processes using technology.

- a. Apply existing knowledge to generate new ideas, products, or processes
- b. Create original works as a means of personal or group expression

## 2. Communication and Collaboration

Students use digital media and environments to communicate and work collaboratively, including at a distance, to support individual learning and contribute to the learning of others.

- b. Communicate information and ideas effectively to multiple audiences using a variety of media and formats

## 4. Critical Thinking, Problem Solving, and Decision Making

Students use critical thinking skills to plan and conduct research, manage projects, solve problems, and make informed decisions using appropriate digital tools and resources.

- a. Identify and define authentic problems and significant questions for investigation
- b. Plan and manage activities to develop a solution or complete a project
- c. Collect and analyze data to identify solutions and/or make informed decisions
- d. Use multiple processes and diverse perspectives to explore alternative solutions

## 6. Technology Operations and Concepts

Students demonstrate a sound understanding of technology concepts, systems, and operations.

- a. Understand and use technology systems
- b. Select and use applications effectively and productively
- c. Troubleshoot systems and applications
- d. Transfer current knowledge to learning of new technologies