

# Information and Media Literacy

Accessing and managing information. Integrating and creating information. Evaluating and analyzing information.

## 21st Century Tools for: Communication, Information Processing, and Research

## SAMPLE Student Outcomes for: Accessing, Processing, Managing, Integrating and Communicating Information



### 4th Grade

Newspapers, books, spreadsheets, graphing programs, calculators, computers, Internet, films, TV programs, Websites, databases, internet and digital libraries

- Access information from a variety of media sources.
- Gather data such as taking surveys of their school or community population and create appropriate graphs to display the information.
- Analyze and compare numerical data from a variety of age-appropriate sources such as newspapers and websites, and draw simple conclusions about the data.



### 8th Grade

Newspapers, books, spreadsheets, graphing programs, calculators, computers, Internet, films, TV programs, Websites, databases, internet and digital libraries

- Find, access, and acquire the necessary data needed to address a question generated by students.
- Formulate questions related to students' physical environment or two populations or cultures, design studies that can answer the questions, and collect appropriate data.
- Analyze graphs and other data representations from the media relative to their truthfulness and ability to persuade/mislead a reader.



### 12th Grade

Newspapers, books, spreadsheets, graphing programs, calculators, computers, Internet, films, TV programs, Websites, databases, internet and digital libraries

- Find and analyze data sets and collection processes with respect to the authenticity of the data and legitimacy of its use for various purposes.
- Develop methods to collect univariate and bivariate data to describe trends within and between populations or local settings.
- Use understanding of statistical techniques, sampling bias, and population parameters in simulated settings to study the effects on outcomes. Analyze these factors in published scientific or economic reports, and use knowledge of statistical techniques to evaluate the validity of the reports' findings.



# Communication Skills

*Understanding, managing, and creating effective communications: orally, written, using multimedia.*

## 21st Century Tools for: Communication, Information Processing, and Research

## SAMPLE Student Outcomes for: Accessing, Processing, Managing, Integrating and Communicating Information



### 4th Grade

Word processing programs, graphic programs, presentation software, desktop publishing programs

- Present mathematical information in an oral report accompanied by charts and graphs.
- Construct charts and graphs to display mathematical information such as survey data.
- Use presentation software to present data used in a graph or project (such as a budget, scientific report, or economic analysis).



### 8th Grade

Word processing programs, graphic programs, presentation software, desktop publishing programs

- Prepare oral presentations of group math projects that demonstrate conceptual understanding as well as application in a specific context.
- Present written explanation of problem solving process and solution with included diagrams, tables, charts, and graphs as needed.
- Use linked table, graph, and symbolic representations (as can be displayed in a spreadsheet) to explain how components of a real-world situation are connected and how changes impact the entire system.



### 12th Grade

Word processing programs, graphic programs, presentation software, desktop publishing programs

- Give an oral presentation using the language of mathematics to express mathematical ideas precisely to peers and teacher in content specific and applied settings.
- Create a written argument that demonstrates the development of a mathematical conjecture and creates a convincing proof of its validity or disproof.
- Creates a presentation that uses dynamic images to illustrate a mathematical concept, connection, or problem and its applicability to a real-world context.



# Critical Thinking and Systems Thinking

Use logical reasoning skills. Becoming numerate. Skillful in using various Problem-Solving strategies.

## 21st Century Tools for: Thinking and Problem Solving

## SAMPLE Student Outcomes for: Thinking and Problem Solving



### 4th Grade

Word processing software, manipulatives, calculators, graphing calculators, spreadsheet software, probes, GPS, and geometry tool software.

- Apply a variety of age-appropriate strategies to solve simple open-ended problems with real-life applications, such as comparison shopping, time-distance, or measurement and proportion problems.
- Use word processing or online forums to record journal entries of their math experiences.
- Use presentation software to share their problem-solving strategies.



### 8th Grade

Word processing software, manipulatives, calculators, graphing calculators, spreadsheet software, probes, GPS, and geometry tool software.

- Solve problems using computation, customary and metric measurements, scale factors, ratios, and proportions
- Create graphical representations of data using graphing calculators and spreadsheets.



### 12th Grade

Word processing software, manipulatives, calculators, graphing calculators, spreadsheet software, probes, GPS, and geometry tool software.

- Employ more complex problem-solving methods to develop a deeper understanding of mathematics, such as simulating a construction project (within certain material & budget constraints).
- Formulate, approach, and solve problems beyond those studied using a variety of problem-solving tools such as graphing calculators, probes, GPS, and geometry tool software.





# Problem Identification, Formulation and Solution

Ability to identify, analyze, and solve problems.

## 21st Century Tools for: Thinking and Problem Solving

## SAMPLE Student Outcomes for: Thinking and Problem Solving

### 4th Grade



Manipulatives, calculators, graphing calculators, Smart Boards, presentation software.

- Plan, visualize, estimate, measure, test and revise their understanding of geometric shapes and measurement concepts.
- Visually demonstrate, highlight and display various patterns and relationships among numbers using virtual whiteboards and calculators.

### 8th Grade



Manipulatives, calculators, graphing calculators, Smart Boards, presentation software.

- Select and apply appropriate problem-solving strategies in an online group.
- Solve real-life problems involving money, such as using existing e-commerce.
- Use physical and digital models to demonstrate mathematical concepts .
- Use calculators to solve computational problems.

### 12th Grade



Manipulatives, calculators, graphing calculators, Smart Boards, presentation software.

- Apply an appropriate strategy to solve problems both individually and in a group.
- Use estimation to determine the reasonableness of an answer and use word-processing software to explain the process.
- Use physical and digital models to demonstrate mathematical concepts.

# Creativity and Intellectual Curiosity

*Develop and communicate ideas to others.*

## 21st Century Tools for: Thinking and Problem Solving

### SAMPLE Student Outcomes for: Thinking and Problem Solving

#### 4th Grade



Digital cameras, laptop computers, multimedia presentation software, graphing calculators, probes/CBRs, Website development software

- Use digital cameras to photograph representations of geometry concepts from their surroundings.
- Transfer the photo images to create a math slide show.
- Give a presentation for an audience to explain geometry concepts.

#### 8th Grade



Digital cameras, laptop computers, multimedia presentation software, graphing calculators, probes/CBRs, Website development software

- Use mathematical understanding and problem-solving processes to identify a community problem (such as using a limited number of buses for an expanding student body).
- Generate and analyze possible solutions for the community problem.

#### 12th Grade



Digital cameras, laptop computers, multimedia presentation software, graphing calculators, probes/CBRs, Website development software

- Use graphing calculators and probes to collect and analyze environmental data (e.g., pH of streams) or contextual data (e.g., speed of cars in school zones).
- Develop an audience-appropriate presentation that uses analysis, interpretation and display of data and related inferences to describe the situation and possible solutions.



# Interpersonal and Collaborative Skills

*Working well on a team. Exercising respect for diversity of opinions.*

## 21st Century Tools for: Interpersonal and Self- Directional Skills

## SAMPLE Student Outcomes for: Interpersonal and Self- Directional Skills

### 4th Grade



Calculators, newspapers, Internet, spreadsheet programs, presentation software, video equipment

- Create an age-appropriate portfolio that includes a problem-solving situation related to real life.
- Create a self-assessment for evaluating a variety of age-appropriate concepts, and provide a written reflection of their problem-solving process/thinking.

### 8th Grade



Calculators, newspapers, Internet, spreadsheet programs, presentation software, video equipment

- Create an age-appropriate portfolio that includes a problem-solving situation related to real life.
- Create a self-assessment for evaluating a variety of age-appropriate concepts, and provide a written reflection of their problem-solving process/thinking.

### 12th Grade



Calculators, newspapers, Internet, spreadsheet programs, presentation software, video equipment

- Create a culminating project that demonstrates content knowledge and conceptual understanding in at least three distinct content areas; project should demonstrate problem-solving ability and ability to draw connections between mathematics content and real world settings.



# Self-Direction

*Monitoring one's own understanding and learning.*

## 21st Century Tools for: Interpersonal and Self- Directional Skills

### SAMPLE Student Outcomes for: Interpersonal and Self- Directional Skills



#### 4th Grade

Calculators, computers, books,  
newspapers

- Create an age-appropriate portfolio that includes a problem-solving situation related to real life.
- Create a test with a variety of concepts, and a written reflection of their problem-solving process/thinking.



#### 8th Grade

Calculators, computers, books,  
newspapers

- Create an age-appropriate portfolio that includes a problem-solving situation related to real life.
- Create a test with a variety of concepts, and a written reflection of their problem solving process/thinking.



#### 12th Grade

Calculators, computers, books,  
newspapers

- Create a culminating project that demonstrates content knowledge and conceptual understanding in at least three distinct content areas; project should demonstrate problem-solving ability and ability to draw connections between mathematics content and real world settings.



# Accountability and Adaptability

*Exercising personal responsibility and flexibility in various contexts. Setting and meeting high standards and goals for one's self and others.*

## 21st Century Tools for: Interpersonal and Self- Directional Skills

## SAMPLE Student Outcomes for: Interpersonal and Self- Directional Skills



### 4th Grade

Internet, presentation software, word processing, desktop publishing

- Establish ongoing communication with students from other communities or countries (via letters, email, or electronic bulletin boards) to share math projects.
- Develop and execute a plan to use measurements and a graphing program to collect and record accurate and complete data about the community playgrounds.



### 8th Grade

Internet, presentation software, word processing, desktop publishing

- Gather pertinent data from multiple sources to create a math game that reflects concepts from class and explain the game through appropriate channels (e.g., hand in manually; send as email attachment; or present orally).
- Participate in national math competitions, where students are responsible for the quality of the data they submit.
- Gather and critically analyze data from a variety of sources, and understand how and why data may not be consistent.



### 12th Grade

Internet, presentation software, word processing, desktop publishing

- Work on higher level mathematics that can be submitted to an agency outside the classroom (e.g., national contest, local newspaper, math bee).
- Use online bulletin boards to engage in discussions of math concepts with people (students and/or experts) from around the world; demonstrate tolerance and respect for the points of view of others.





# Social Responsibility

Acting responsibly with the interests of the larger community in mind. Demonstrating ethical behavior in personal, workplace and community contexts.

## 21st Century Tools for: Interpersonal and Self- Directional Skills

## SAMPLE Student Outcomes for: Interpersonal and Self- Directional Skills



### 4th Grade

Internet, presentation software, newspapers

- Children use age-appropriate mathematical and ICT skills to participate in a community service project.



### 8th Grade

Internet, presentation software, newspapers

- Incorporate math concepts into a community service project such as a recycling program – and research facts to determine how much of the recycled parts are used in various items.



### 12th Grade

Internet, presentation software, newspapers

- Identify a potential community issue that can be analyzed using a wide range of mathematical tools and develop an analysis plan.
- Collect and analyze data, and develop a report presenting data and possible interventions to address local issues.

