MATH
MODELING

GETTING STARTED & GETTING SOLUTIONS

CONNECTIONS TO

COMMON CORE

STATE STANDARDS

AUTHORS
Karen M. Bliss
Department of Math & Computer Science,
Quinnipiac University, Hamden, CT

Kathleen R. Fowler
Department of Math & Computer Science,
Clarkson University, Potsdam, NY

Benjamin J. Galluzzo
Department of Mathematics,
Shippensburg University, Shippensburg, PA

CONNECTIONS BETWEEN THE MATHEMATICAL MODELING MATERIAL PRESENT IN <u>MATH MODELING: GETTING STARTED & GETTING SOLUTIONS</u> CAN BE MADE TO THE COMMON CORE STATE STANDARDS. CONNECTIONS HAVE BEEN DRAWN WITHIN THE AREAS OF MATHEMATICS, ENGLISH, AND SCIENCE. THE STANDARDS WITH A STAR (★) INDICATE A SPECIFIC MATH MODELING STANDARD AS DEFINED BY THE COMMON CORE.

1. INTRO-DUCTION

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MATH

CCSS.Math.Content.HSF-IF.A.1
Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If f is a function and x is an element of its domain, then $f(x)$ denotes the output of f corresponding to the input x. The graph of f is the graph of the equation $y = f(x)$.

CCSS.Math.Content.HSF-IF.A.2
Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.

CCSS.Math.Content.HSF-BF.A.1
Write a function that describes a relationship between two quantities. ✦

CCSS.Math.Content.HSF-LE.B.5
Interpret the parameters in a linear or exponential function in terms of a context.

ENGLISH

CCSS.ELA-Literacy.W.11-12.8
Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.

CCSS.ELA-Literacy.RI.11-12.7
Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem.

SCIENCE

CCSS.ELA-Literacy.SL.11-12.1b
Work with peers to promote civil, democratic discussions and decision-making, set clear goals and deadlines, and establish individual roles as needed.

CCSS.ELA-Literacy.SL.11-12.1c
Propel conversations by posing and responding to questions that probe reasoning and evidence; ensure a hearing for a full range of positions on a topic or issue; clarify, verify, or challenge ideas and conclusions; and promote divergent and creative perspectives.

CCSS.ELA-Literacy.SL.11-12.1d
Respond thoughtfully to diverse perspectives; synthesize comments, claims, and evidence made on all sides of an issue; resolve contradictions when possible; and determine what additional information or research is required to deepen the investigation or complete the task.

CCSS.ELA-Literacy.SL.11-12.2
Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data.

CCSS.ELA-Literacy.SL.11-12.3
Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric, assessing the stance, premises, links among ideas, word choice, points of emphasis, and tone used.

CCSS.ELA-Literacy.RST.11-12.1
Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.

CCSS.ELA-Literacy.RST.11-12.7
Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.

CCSS.ELA-Literacy.RST.11-12.9
Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.

2. DEFINING THE PROBLEM STATEMENT

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ENGLISH

CCSS.ELA-Literacy.W.11-12.1a
Introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that logically sequences claim(s), counterclaims, reasons, and evidence.

CCSS.ELA-Literacy.W.11-12.1b
Develop claim(s) and counterclaims fairly and thoroughly, supplying the most relevant evidence for each while pointing out the strengths and limitations of both in a manner that anticipates the audience's knowledge level, concerns, values, and possible biases.

CCSS.ELA-Literacy.W.11-12.2a
Introduce a topic; organize complex ideas, concepts, and information so that each new element builds on that which precedes it to create a unified whole; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension

CCSS.ELA-Literacy.W.11-12.8
Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation

CCSS.ELA-Literacy.RI.11-12.7
Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem

CCSS.ELA-Literacy.SL.11-12.1b
Work with peers to promote civil, democratic discussions and decision-making, set clear goals and deadlines, and establish individual roles as needed

SCIENCE

CCSS.ELA-Literacy.SL.11-12.1c
Propel conversations by posing and responding to questions that probe reasoning and evidence; ensure a hearing for a full range of positions on a topic or issue; clarify, verify, or challenge ideas and conclusions; and promote divergent and creative perspectives.

CCSS.ELA-Literacy.SL.11-12.1d
Respond thoughtfully to diverse perspectives; synthesize comments, claims, and evidence made on all sides of an issue; resolve contradictions when possible; and determine what additional information or research is required to deepen the investigation or complete the task.

CCSS.ELA-Literacy.SL.11-12.2
Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data.

CCSS.ELA-Literacy.SL.11-12.3
Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric, assessing the stance, premises, links among ideas, word choice, points of emphasis, and tone used.

CCSS.ELA-Literacy.RST.11-12.1
Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.

CCSS.ELA-Literacy.RST.11-12.2
Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.

CCSS.ELA-Literacy.RST.11-12.7
Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.

CCSS.ELA-Literacy.RST.11-12.9
Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.

3. MAKING ASSUMP-TIONS

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MATH

CCSS.Math.Content.HSF-LE.A.1b
Recognize situations in which one quantity changes at a constant rate per unit interval relative to another.

CCSS.Math.Content.HSF-LE.A.1c
Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another.

CCSS.Math.Content.HSF-LE.B.5
Interpret the parameters in a linear or exponential function in terms of a context.

CCSS.Math.Content.HSS-IC.A.1
Understand statistics as a process for making inferences about population parameters based on a random sample from that population.

ENGLISH

CCSS.ELA-Literacy.W.11-12.1
Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.

CCSS.ELA-Literacy.W.11-12.2b
Develop the topic thoroughly by selecting the most significant and relevant facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic.

CCSS.ELA-Literacy.W.11-12.9
Draw evidence from literary or informational texts to support analysis, reflection, and research.

CCSS.ELA-Literacy.RI.11-12.7
Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem.

SCIENCE

CCSS.ELA-Literacy.SL.11-12.1a
Come to discussions prepared, having read and researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well-reasoned exchange of ideas.

CCSS.ELA-Literacy.SL.11-12.1b
Work with peers to promote civil, democratic discussions and decision-making, set clear goals and deadlines, and establish individual roles as needed.

CCSS.ELA-Literacy.SL.11-12.1c
Propel conversations by posing and responding to questions that probe reasoning and evidence; ensure a hearing for a full range of positions on a topic or issue; clarify, verify, or challenge ideas and conclusions; and promote divergent and creative perspectives.

CCSS.ELA-Literacy.SL.11-12.1d
Respond thoughtfully to diverse perspectives; synthesize comments, claims, and evidence made on all sides of an issue; resolve contradictions when possible; and determine what additional information or research is required to deepen the investigation or complete the task.

CCSS.ELA-Literacy.SL.11-12.2
Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data.

CCSS.ELA-Literacy.SL.11-12.3
Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric, assessing the stance, premises, links among ideas, word choice, points of emphasis, and tone used.

CCSS.ELA-Literacy.RST.11-12.1
Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.

CCSS.ELA-Literacy.RST.11-12.7
Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.

CCSS.ELA-Literacy.RST.11-12.9
Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.

4.
DEFINING VARIABLES

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MATH

CCSS.Math.Content.HSN-Q.A.1
Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.

CCSS.Math.Content.HSN-Q.A.2
Define appropriate quantities for the purpose of descriptive modeling.

CCSS.Math.Content.HSN-Q.A.3
Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

CCSS.Math.Content.HSA-CED.A.4
Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. For example, rearrange Ohm's law $V = IR$ to highlight resistance R.

CCSS.Math.Content.HSF-LE.B.5
Interpret the parameters in a linear or exponential function in terms of a context.

ENGLISH

CCSS.ELA-Literacy.W.11-12.9
Draw evidence from literary or informational texts to support analysis, reflection, and research.

CCSS.ELA-Literacy.SL.11-12.1b
Work with peers to promote civil, democratic discussions and decision-making, set clear goals and deadlines, and establish individual roles as needed.

CCSS.ELA-Literacy.SL.11-12.1c
Propel conversations by posing and responding to questions that probe reasoning and evidence; ensure a hearing for a full range of positions on a topic or issue; clarify, verify, or challenge ideas and conclusions; and promote divergent and creative perspectives.

CCSS.ELA-Literacy.SL.11-12.1d
Respond thoughtfully to diverse perspectives; synthesize comments, claims, and evidence made on all sides of an issue; resolve contradictions when possible; and determine what additional information or research is required to deepen the investigation or complete the task.

CCSS.ELA-Literacy.SL.11-12.2
Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data.

CCSS.ELA-Literacy.SL.11-12.3
Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric, assessing the stance, premises, links among ideas, word choice, points of emphasis, and tone used.

SCIENCE

CCSS.ELA-Literacy.RST.11-12.1
Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.

CCSS.ELA-Literacy.RST.11-12.7
Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.

CCSS.ELA-Literacy.RST.11-12.9
Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.

5. BUILDING SOLUTIONS

MATH

CCSS.Math.Content.HSA-REI.D.10
Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve (which could be a line).

CCSS.Math.Content.HSA-REI.D.11
Explain why the x-coordinates of the points where the graphs of the equations $y = f(x)$ and $y = g(x)$ intersect are the solutions of the equation $f(x) = g(x)$; find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations. Include cases where $f(x)$ and/or $g(x)$ are linear, polynomial, rational, absolute value, exponential, and logarithmic functions. ✶

CCSS.Math.Content.HSF-IF.A.2
Use function notation, evaluate functions for inputs in theirdomains, and interpret statements that use function notation in terms of a context.

CCSS.Math.Content.HSF-IF.A.3
Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers. For example, the Fibonacci sequence is defined recursively by $f(0) = f(1) = 1$, $f(n+1) = f(n) + f(n-1)$ for $n \geq 1$.

CCSS.Math.Content.HSF-IF.B.4
For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity. ✶

CCSS.Math.Content.HSF-IF.B.5
Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. For example, if the function $h(n)$ gives the number of person-hours it takes to assemble n engines in a factory, then the positive integers would be an appropriate domain for the function. ✶

CCSS.Math.Content.HSF-IF.C.7
Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. ✶

CCSS.Math.Content.HSF-IF.C.7a
Graph linear and quadratic functions and show intercepts, maxima, and minima.

CCSS.Math.Content.HSF-IF.C.7b
Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.

CCSS.Math.Content.HSF-IF.C.7c
Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.

CCSS.Math.Content.HSF-IF.C.7d
Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior.

CCSS.Math.Content.HSF-IF.C.7e
Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude.

CCSS.Math.Content.HSF-IF.C.8a
Use the process of factoring and completing the square in a quadratic function to show zeros, extreme values, and symmetry of the graph, and interpret these in terms of a context.

CCSS.Math.Content.HSF-BF.A.1
Write a function that describes a relationship between two quantities. ✦

CCSS.Math.Content.HSF-LE.A.1
Distinguish between situations that can be modeled with linear functions and with exponential functions.

CCSS.Math.Content.HSF-LE.A.1b
Recognize situations in which one quantity changes at a constant rate per unit interval relative to another.

CCSS.Math.Content.HSF-LE.A.1c
Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another.

CCSS.Math.Content.HSF-LE.B.5
Interpret the parameters in a linear or exponential function in terms of a context.

CCSS.Math.Content.HSS-IC.B.6
Evaluate reports based on data.

ENGLISH

CCSS.ELA-Literacy.W.11-12.6
Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.

CCSS.ELA-Literacy.SL.11-12.1b
Work with peers to promote civil, democratic discussions and decision-making, set clear goals and deadlines, and establish individual roles as needed.

CCSS.ELA-Literacy.SL.11-12.1c
Propel conversations by posing and responding to questions that probe reasoning and evidence; ensure a hearing for a full range of positions on a topic or issue; clarify, verify, or challenge ideas and conclusions; and promote divergent and creative perspectives.

CCSS.ELA-Literacy.SL.11-12.1d
Respond thoughtfully to diverse perspectives; synthesize comments, claims, and evidence made on all sides of an issue; resolve contradictions when possible; and determine what additional information or research is required to deepen the investigation or complete the task.

CCSS.ELA-Literacy.SL.11-12.2
Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data.

CCSS.ELA-Literacy.SL.11-12.3
Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric, assessing the stance, premises, links among ideas, word choice, points of emphasis, and tone used.

SCIENCE

CCSS.ELA-Literacy.RST.11-12.1
Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.

CCSS.ELA-Literacy.RST.11-12.3
Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.

CCSS.ELA-Literacy.RST.11-12.8
Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.

6. ANALYSIS & MODEL ASSESSMENT

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MATH

CCSS.Math.Content.HSN-Q.A.1
Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.

CCSS.Math.Content.HSN-Q.A.2
Define appropriate quantities for the purpose of descriptive modeling.

CCSS.Math.Content.HSA-CED.A.2
Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.

CCSS.Math.Content.HSA-CED.A.3
Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context. For example, represent inequalities describing nutritional and cost constraints on combinations of different foods.

CCSS.Math.Content.HSF-IF.A.2
Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.

CCSS.Math.Content.HSF-IF.B.4
For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity. ✦

CCSS.Math.Content.HSF-IF.B.5
Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. For example, if the function $h(n)$ gives the number of person-hours it takes to assemble n engines in a factory, then the positive integers would be an appropriate domain for the function. ✦

CCSS.Math.Content.HSF-LE.B.5
Interpret the parameters in a linear or exponential function in terms of a context.

ENGLISH

CCSS.ELA-Literacy.W.11-12.6
Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.

CCSS.ELA-Literacy.SL.11-12.1b
Work with peers to promote civil, democratic discussions and decision-making, set clear goals and deadlines, and establish individual roles as needed.

CCSS.ELA-Literacy.SL.11-12.1c
Propel conversations by posing and responding to questions that probe reasoning and evidence; ensure a hearing for a full range of positions on a topic or issue; clarify, verify, or challenge ideas and conclusions; and promote divergent and creative perspectives.

CCSS.ELA-Literacy.SL.11-12.1d
Respond thoughtfully to diverse perspectives; synthesize comments, claims, and evidence made on all sides of an issue; resolve contradictions when possible; and determine what additional information or research is required to deepen the investigation or complete the task.

CCSS.ELA-Literacy.SL.11-12.2
Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data.

CCSS.ELA-Literacy.SL.11-12.3
Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric, assessing the stance, premises, links among ideas, word choice, points of emphasis, and tone used.

SCIENCE

CCSS.ELA-Literacy.RST.11-12.1
Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.

CCSS.ELA-Literacy.RST.11-12.3
Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.

7. PUTTING IT ALL TOGETHER

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MATH

CCSS.Math.Content.HSN-Q.A.1
Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.

CCSS.Math.Content.HSN-Q.A.2
Define appropriate quantities for the purpose of descriptive modeling.

CCSS.Math.Content.HSN-Q.A.3
Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

ENGLISH

CCSS.ELA-Literacy.W.11-12.1c
Use words, phrases, and clauses as well as varied syntax to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims.

CCSS.ELA-Literacy.W.11-12.1d
Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.

CCSS.ELA-Literacy.W.11-12.1e
Provide a concluding statement or section that follows from and supports the argument presented.

CCSS.ELA-Literacy.W.11-12.2
Write informative/explanatory texts to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content.

CCSS.ELA-Literacy.W.11-12.2c
Use appropriate and varied transitions and syntax to link the major sections of the text, create cohesion, and clarify the relationships among complex ideas and concepts.

CCSS.ELA-Literacy.W.11-12.2d
Use precise language, domain-specific vocabulary, and techniques such as metaphor, simile, and analogy to manage the complexity of the topic.

CCSS.ELA-Literacy.W.11-12.2e
Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.

CCSS.ELA-Literacy.W.11-12.2f
Provide a concluding statement or section that follows from and supports the information or explanation presented (e.g., articulating implications or the significance of the topic.

CCSS.ELA-Literacy.W.11-12.4
Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. (Grade-specific expectations for writing types are defined in standards 1–3 above.)

CCSS.ELA-Literacy.W.11-12.5
Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. (Editing for conventions should demonstrate command of Language standards 1–3 up to and including grades 11–12 here.)

CCSS.ELA-Literacy.W.11-12.6
Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.

CCSS.ELA-Literacy.W.11-12.7
Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.

CCSS.ELA-Literacy.SL.11-12.1b
Work with peers to promote civil, democratic discussions and decision-making, set clear goals and deadlines, and establish individual roles as needed.

CCSS.ELA-Literacy.SL.11-12.1c
Propel conversations by posing and responding to questions that probe reasoning and evidence; ensure a hearing for a full range of positions on a topic or issue; clarify, verify, or challenge ideas and conclusions; and promote divergent and creative perspectives.

CCSS.ELA-Literacy.SL.11-12.1d
Respond thoughtfully to diverse perspectives; synthesize comments, claims, and evidence made on all sides of an issue; resolve contradictions when possible; and determine what additional information or research is required to deepen the investigation or complete the task.

CCSS.ELA-Literacy.SL.11-12.2
Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data.

CCSS.ELA-Literacy.SL.11-12.3
Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric, assessing the stance, premises, links among ideas, word choice, points of emphasis, and tone used.

CCSS.ELA-Literacy.SL.11-12.4
Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks.

CCSS.ELA-Literacy.SL.11-12.5
Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.

CCSS.ELA-Literacy.SL.11-12.6
Adapt speech to a variety of contexts and tasks, demonstrating a command of formal English when indicated or appropriate. (See grades 11–12 Language standards 1 and 3 here for specific expectations.)

SCIENCE

CCSS.ELA-Literacy.RST.11-12.1
Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.
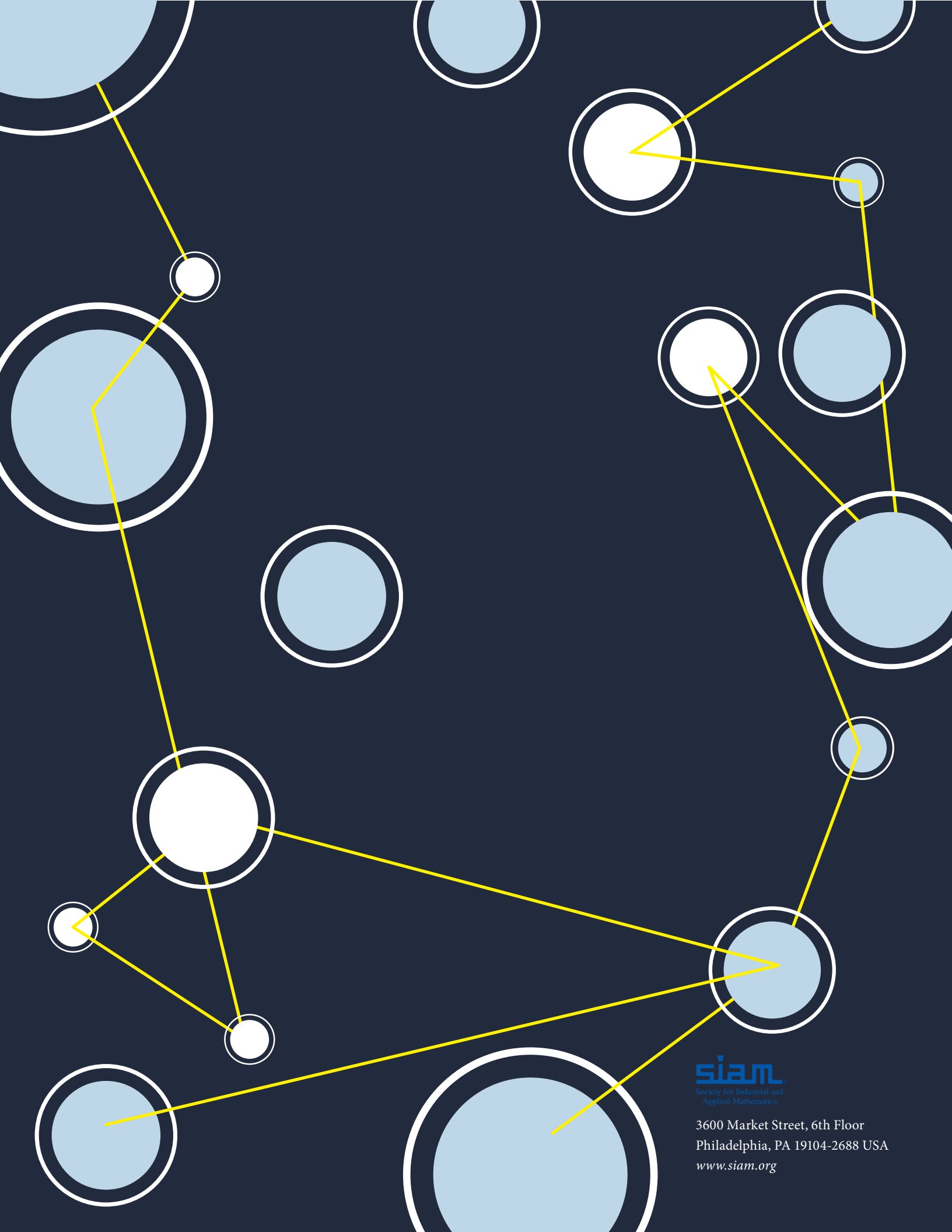
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Society for Industrial and
Applied Mathematics

3600 Market Street, 6th Floor
Philadelphia, PA 19104-2688 USA
www.siam.org